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EVALUATION OF

- **Assessment and rehabilitation of community irrigation schemes and restorations of irrigation water in rural areas**
  FAO Code: OSRO/IRQ/402/UDG
  UNDG Code: **A5 – 01**

- **Improvement of water supply and drainage provision through the rehabilitation of pumping stations with conclusions and recommendations**
  FAO Code: OSRO/IRQ/403/UDG
  UNDG Code: **A5 - 02**

- **Assessment, emergency maintenance and rehabilitation of the community irrigation schemes and restoration of water supply in rural areas.**
  FAO Code: OSRO/IRQ/404/UDG
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Final Report
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Executive summary

The present evaluation focused on three projects implemented in Iraq from 2004 to 2008 by FAO with UN ITF funding: OSRO/IRQ/402/UDG, OSRO/IRQ/403/UDG and OSRO/IRQ/404/UDG, all dealing with the rehabilitation of the infrastructure in the irrigated agriculture sector with the objectives of increasing agricultural production, ensuring food security, provide potable water for domestic use and improvement in quality of life in Iraq.

The purpose of the evaluation was to assess the status of the projects implementation, their impacts on beneficiaries, major constraints faced; and to formulate recommendations for the Government, FAO and other development partners on further steps necessary to consolidate progress and sustainability of the projects interventions.

The evaluation was conducted towards the end of the project life. The evaluation team consisted of a Team Leader, an Irrigation Specialist and a Survey Coordinator. Ten surveyors were recruited from Iraq for primary data collection. The evaluation team conducted two missions one from September 19 - 30, 2008 and second one from January 19 - 30, 2009.

For security reasons the international evaluators were not able to go to Iraq to see achievements on the ground and meet with beneficiaries in person. They had to rely on a team of 10 Iraqi surveyors. Questionnaires were developed and the Iraqi surveyors were trained in Jordan on how to collect and document information in all project locations and from the main counterpart for the projects: the Ministry of Water Resources (MoWR) in Baghdad and Erbil. This 'remote control' evaluation method put significant limits to the depth of analysis and precision this evaluation could achieve. However, the evaluation did use telephonic and email communications to verify or clarify some of the data collected by surveyors. It should be recognized that this methodology left significant weakness in the quality of data, but under the circumstances this was the best approach available.

Agricultural production in Iraq depends mostly on irrigation. But over-irrigation as well as drainage problems (silted canals, non-operational drainage pumping stations, etc.) has caused severe water logging and salinity problems in most of the irrigation schemes built between the Tigris and Euphrates rivers. Sanctions and conflicts during the last two decades have severely affected the operation and maintenance of irrigation and drainage systems (i.e. canals and pumping stations). In the irrigation schemes, yields of major crops have significantly decreased as a result of salinity and water logging and large areas remained uncultivated, affecting farmers' income. This is one of the factors contributing to the migration of a large section of rural population to cities in search of employment.

The projects were implemented from the FAO Project Management Unit. This Unit, initially located in Iraq, was relocated to Amman when the UN decided to leave Baghdad as a result of the Canal Hotel bombing in 2003. The three projects started in

2004 and were therefore designed, managed and monitored by FAO from its Amman office in Jordan, initially under the assumption that security would improve and allow for closer supervision by FAO staff at project sites.

This system, popularly known as "supervision by remote control" and unavoidable given the circumstances, tended to delay decision making and left FAO managers somewhat dependent on government staff for information. However, an effort to hire resident engineers through third party companies alleviated this concern. FAO issued contracts with companies for civil, mechanical and electrical expertise in Iraq. The contract included i) feasibility study, bills of quantities and tender documentation design, ii) technical supervision of works carried out by contractors in Iraq and iii) monitoring and reporting. This third-party independent expertise was required to review, verify and analyse information received from Government counterparts, or in many cases to generate the information not provided by Government counterparts. The system of resident engineers worked reasonably well, though at a significant cost.

Overall, the evaluation indicated that out of the 3 projects only one (OSRO/IRQ/404/UDG) was successfully implemented with most project objectives achieved. In projects OSRO/IRQ/402/UDG and OSRO/IRQ/403/UDG, project objectives were only partially achieved. A more detailed account of projects results follows.

Project OSRO/IRQ/402/UDG (budget: US$5,126,600):

Initially the project was intended for Ramadi and Saqlawiya, for which FAO completed significant preparatory work (feasibility studies, bills of quantities, tenders). This was subsequently changed to Hilla-Hashimiya (Babylon Governorate) at the request of the MoWR, resulting in an 8-month delay with associated costs.

The main problem at Hilla-Hashemia was that due to intermittent power supply at the Al-Shomally pumping station used to drain the scheme, the main drain had been filled with water for long periods of time and thus silted and overgrown by weeds, resulting in extensive water logging in the scheme. The project objective was to excavate the main drain so as to improve drainage and reduce the water table to an acceptable level. The total area to be reclaimed was estimated at 62,000 hectares and more than 50,000 farming families were expected to benefit from the project.

A contract for excavation work on the main drain was awarded to an Iraqi company in December 2005. After one year of work, the Al-Shomally pumping station broke down, which meant that the drainage canal could no longer be dewatered to facilitate excavation work. The contractor tried to pump with his own means but did not succeed. By then, 36.5 km was excavated, i.e. 73% of the intended 50 km. Total excavated materials amounted to 1.7 ml m^3 or 85% of the total contract quantity.[1] Since the contractor could not work anymore, FAO ended the contract.

[1] The discrepancy between those two rates of achievement is due to higher-than-expected siltation in the drain.

Under project 403, FAO conducted a feasibility study for the rehabilitation of the Al-Shomally pumping station. The estimated cost (US$6 ml) far exceeded the resources available to FAO at the time.

According to survey result, only 200 families would be residing and cultivating the scheme at evaluation time. It was unclear whether this referred to landowners or sharecroppers. It could be that the scheme is depopulated, or that many more sharecropping families exploit the scheme. Feedback from residing households indicate that the excavation work resulted in moderate loss of arable land along the drain[2] and reduced water logging in the immediate vicinity of the drain but not further. Even this limited improvement is likely to be short-lived as the drain is filling up again and the drainage problem will therefore return. The MoWR took responsibility for the remaining works and in 2009 contracted the supply of three new pump sets which should be commissioned in 2010. The cleaning of the remaining part of the main drain will follow the installation of the pumps.

The component dealing with water user associations and the training of farmers were dropped from this project[3]. This is probably due to the fact that the legislative framework in Southern and Central Iraq does not allow the formation of water users association[4]. This is regrettable since under the prevailing security situation in Iraq, such institutions could play an important role in improving the management of the schemes.

Piezometers for monitoring water table and salinity were procured and delivered to the MoWR, which unfortunately have not installed them yet

The capacity development component (one training course on "Operation and Maintenance of Irrigation and Drainage Schemes" held for 10 MoWR engineers at Cranfield University, England) was successfully completed. Finally, the equipments procured under the project (one excavator, two tipper trucks, one fuel tanker and two water tankers) is currently being used by the MoWR on other schemes.

- **Recommendation 1:** The network of piezometers should be installed without further delay and FAO should work out a plan with the MoWR to that effect. As most of the irrigation projects in the country suffer from the twin problems of water logging and salinity, such monitoring is extremely important for proper management of the water table and soil and water quality for agricultural production.
- **Recommendation 2:** Any further work on the Hilla-Hashemia scheme is dependant on the rehabilitation of the Al Shomally pumping station, for which adequate funding should be secured from the Government budget and/or from donors.

Project OSRO/IRQ/403/UDG (budget: US$25,158,544):

The MoWR operates 305 pumping stations, for which the project designed a pumping station database which was being filled at evaluation time. The project was originally

[2] The drain was also widened and a road constructed along it for machinery operation.
[3] But reportedly completed later under another irrigation project.
[4] Contrary to Kurdistan, where appropriate legislation is reportedly in place.

intended to rehabilitate 125 priority pumping stations, a figure not based on precise needs assessments. A complete and detailed status report for the first 12 priority pumping stations to be rehabilitated was produced. A risk management study completed in 2004 indicated that for all these, the best approach would be to replace the pumps with exactly the same type of equipment to avoid commissioning and operating problems. By contracting the original manufacturer, pumping stations can be rehabilitated without construction of civil works, which are very costly in Iraq. However, all the equipment to be replaced had to be manufactured specially for the order as original models were not in production anymore, which led to significant unit cost escalation.

As a result it was subsequently agreed to rehabilitate only 12 stations, later reduced to 8 due to further cost escalation, with three to be supplied and installed by FAO and 5 to be supplied by FAO and installed by the MoWR – a decision taken in the face of poor security conditions leading to Iraqi contractors not being able to install the equipment.

The pumping stations in Kirkuk and Hutaman were satisfactorily completed and illustrate the types of benefits that can be expected of such interventions. Farmers there significantly benefited from the project in terms of increase in commend area, cropping intensity and yield. In Kirkuk, two of the three pumping stations could be restored to near full capacity.[5] There was an improvement in both quantity and quality of drinking water which thanks to the project is now being provided to about 1 million people in Kirkuk town and the immediate vicinity. The cultivated area doubled from 5,000 ha (20,000 donums) to 10,000 ha (40,000 donums). In Hutaman, the pumps installed in September 2008 are presently operating for 15 hours a day, which has significantly reduced both water logging and salinity. Interviewed farmers were highly satisfied with the benefits derived from the project and indicated that that more water was now available for irrigation and water logging and salinity have been reduced. They further indicated that before the project they hardly cultivated any land due to non-availability of irrigation water, but now they are cultivating 3,200 ha (12,800 donums) out of the 3,875 ha (15,500 donums) command area.

Rehabilitation of the other six pumping station has not been completed due to various reasons, with poor security and lack of follow-up action by MoWR being primary factors in almost all cases.

- In Mandeli, located in a very tense area closed to the border with Iran, replacement pumps and other mechanical and electrical equipments were delivered to the site, installed, commissioned and handed over to MoWR in a fully functional condition. But the survey conducted as part of the evaluation showed that only one of the five replaced pumps was currently functioning. The pumps were reportedly working only a few hours a day after commissioning because of low voltage on the electrical grid. Available electrical generators (provided by FAO precisely to offset electrical supply problems) could not be operated most of the time due to the lack of fuel at the site. Since the pumping station provides

[5] The pumping stations in Kirkuk include Al Qadisyah, Al FAO and Al Shaima. At present Al Qadisyah has 14 vertical pumps and Al FAO 8 pumps in operating conditions. Al Shaima was used to irrigate gardens and parks in Kirkuk town and is still out of operation as it was not perceived to be a priority.

drinking water for the town of Mandeli, discontent with on-and-off operation of the pump was brewing. Local militias took it upon themselves to force the site engineer to operate the pumps continuously with low voltage by over riding the electrical safety switches. This resulted in four of the five brand new pump engines having electrical failures in October 2007. FAO organized an inspection team to examine the exact cause of the failures and the report stated low voltage as the main contributing factor. MoWR refused to effect the repairs and demanded that the supplier carry them out. FAO organized a quotation (USD62,000) from the supplier for the repairs and offered to use project funds to repair the pumps – MoWR refused the use of project funds for this purpose. MoWR requested another inspection with their representatives present and FAO organized it – but with the same result (all this in a very insecure area). After the closure of the project, MoWR agreed to the use of project funds for the repairs, but no funding was left. FAO then requested MoWR to consider the use of their own budget to effect the repairs but they refused. Moreover, spare parts for 5 years have been supplied but were not delivered by the Ministry to the station, allegedly due to poor security. At evaluation time, the farmers and station staff termed the project a failure and opined that water availability, water logging, salinity, crop yields, and drinking water quantity and quality have deteriorated since the project. The station was reportedly fixed in May 2009, after the evaluation field work.

- In the North Suwira Pumping Station, the command area of nearly 8,000 ha (31,377 donums) is owned mostly by 3 large companies involved in aquaculture, animal production and raising poultry, and by the government. This is the most important animal, poultry and fish production area in the country and contributes significantly to the national economy. The command area under the project lost productivity due to shortage of water. Drinking water was also in short supply due to same reason. As this was a "supply only" station, MoWR were to install the 4 vertical pumps and matching control panels provided by FAO. Two pumps were installed and two are still pending until the electrical and commissioning is complete on the first two pumps. The pump station is still run by the old pumps but at a much lower capacity.
- In Al Amiriyah Pumping Station ("supply only"), the replacement pumps were procured and delivered but initially could not be installed due to very poor security. The responsibility for installing the pumps (that were stored in Baghdad) is with MoWR who have begun the installation at the beginning of 2009 with their own staff. The survey found that the old pumps of the station were not functioning due to faulty gear, control panels and other accessories.
- The equipment for Salman Pak ("supply only") is reportedly stored in a MoWR compound in Al Sholeh. Installation had not yet started at evaluation time because of the poor security situation. Two old pumps are still working.
- In South Al Huseiniah, the 3 pumps procured and installed by FAO could not be operated do to faulty electric motors bearings producing much vibration. As a result, expected benefits from the project have not been derived yet. The motors have been taken to Baghdad for repairs and the necessary spare parts provided free of cost by the supplier (KSP) in March 2009. The motors are being repaired with new bearings and will be installed shortly.
- In Al Sejilah ("supply only"), the non-functioning pumps were initially replaced by 6 temporary pumps of Chinese origin procured under the MoWR budget with a

rather small capacity ($1m^3$ per second), as a temporary measure to keep the water level down as far as possible till the permanent pumps were installed. Good quality pumps of British origin with electrical control boards, vacuum system, electrical cable and other accessories were installed in 2007, but the pumps have not yet energized by the MoWR. Reason cited for this has been a delay in obtaining some pipes fitting and accessories. A financial proposal has been sent to the Ministry which procured the pipes and fitting. Installation is reportedly ongoing and is expected to be complete by end of 2009. The procured pumps have been lying idle for more than two years.

It should be recognized that huge investments have been made in procurement and installation of pumps and other accessories and some of the investment lay idle for quite some time until the security situation allowed the installation of the equipment. When faced with poor security conditions (leading to Iraqi contractors not being able to install the equipment), FAO agreed with the MoWR for the remaining work to be completed by MoWR.

The unfortunate lack of follow-up by the Ministry could also be due to the prevailing security situation in the "Sunni triangle", although one must stress that according to news report the security in Sunni areas has markedly improved in 2008. Some of the persons contacted by the evaluation mission pointed out at political factors, inasmuch as the MoWR is currently dominated by Shia personnel who might not feel in a particular hurry to install pumps in Sunni areas. This could not be verified. Contacted by the evaluation mission about the lack of follow-up, the MoWR did not provide explanations. It should be stressed that the pumps are designed for particular pumping stations, and would not work properly if installed elsewhere.

- **Recommendation 3:** The MoWR and Iraqi contractors – as appropriate – should fulfil their commitments and install all remaining equipment to the pumping stations for which the equipment was designed as soon as possible.
- **Recommendation 4:** FAO should not entertain future requests regarding pumping stations until the severe operating constraints such as low voltage in the electrical grid and lack of fuel for generators are solved by the Iraqi Government, as experience proves that expensive equipment can fall idle or become permanently damaged if operated under such conditions.

Project OSRO/IRQ/404/UDG (budget: US$16,958,942):

This project was the most successful of the three evaluated projects. Most components were successfully completed, resulting in very significant benefits.

One component was about the rehabilitation of the Heran irrigation scheme located in northern Iraq. In this mountainous area, the irrigated lands are scattered over valleys and use water diverted from springs and streams. Most of the irrigation schemes are managed by communities through Water User's Associations. Unfortunately, some of the infrastructure has been damaged during the eighties and nineties. Recent and recurrent droughts have accelerated degradation. This has caused a large section of population to move to the plains and the cities.

The Heran scheme has a command area of 145 ha and is inhabited by 180 farm families. Significant loss of water from unlined canals reduced the command area to 96 ha. The project was implemented from June 2005 to January 2006 at the very modest cost of US$ 216,546. To reduce water losses, 3.88 km of canals were lined. In addition 2 basins were dug to improve spring water collection. These interventions helped restore the command area to the original 145 ha. According to the survey commissioned by the evaluation, some of the farmers who had left the area due to the deterioration of the scheme returned to farming it. A strong and functional WUA contributed to the equitable management of the system with distribution of water through out the scheme irrespective of location of the agricultural lands in the head, middle or tail areas. The project also increased productivity and farmers income.

The Al Mussaib irrigation scheme (3,000 ha; 2,500 farming families) was successfully rehabilitated. FAO designed a new pumping station and built it through various contractors. A number of problems occurred and resulted in important delays, such as the main intake collapsing once. Interviewed MoWR personnel on site explained that the company contracted by FAO hired a number of sub-contractors and that it was difficult to maintain the required quality of work with proper specifications. The work was successfully completed in early 2008, and included four new pumps, the rehabilitation of a major drain (Drain 22) as well as canal lining and feeder roads.

Interviewed farmers expressed strong satisfaction with the results and explained that agriculture is flourishing again for the first season in years. However, significant ad-hoc extensions of the scheme may result in some farmers taking more water than their share, thus depriving other farmers to their legitimate right to water. The envisaged training of Water Users Associations has not been implemented, perhaps because of the lack of a conducive policy environment for WUA in the Center and South of Iraq, as explained above[6].

Another successful component of the project was the supply of grouting equipments for the Mosul Dam. Initially the project planned to rehabilitate the Al-Thraima scheme. This component was replaced under MoWR request by the supply of grouting equipment for the large Mosul Dam, where foundations require continual grouting to maintain the dam's stability. The dam was originally constructed over multi-strata of gypsum, limestone and clay. Gypsum is a water-soluble mineral susceptible to seepage. Subsequent erosion creates cavities beneath the dam that must be plugged or "grouted" on a regular basis or the whole structure will break open, resulting in hundreds of thousands of casualties in Mosul town and further south. The dam design fortunately includes galleries for grouting, but normal grouting work was negatively affected by the sanction regime and subsequent lack of replacement grouting equipment.

The Government was desperate to access new grouting equipment and FAO accepted to provide them. The Mosul Dam is a multi-purpose dam producing electricity but also diverting water into the Euphrates irrigation and water system. A purchase order for 6 drilling rigs, spare parts and materials was placed in September 2006 and the rigs were delivered to site May/June 2007. The use of this equipment has successfully

[6] However, this training was later completed under another FAO irrigation project.

prevented seepage under the dam. More grouting equipment was reportedly procured by the Government and other donors since then.

It should be recognized that this is only a temporary measure. However, attempts by other donors to implement a permanent solution have so far failed.

Additional project achievements include:

- Three aquatic weed harvesters and surveying instruments including ten survey stations, computers and plotters were also procured and delivered. Three Iraqi engineers have been trained by the manufacturer in the maintenance and use of the harvesters. The aquatic weed harvester and the surveying equipments supplied under the project are reportedly being effectively utilized by the MoWR.
- A total of 30 Iraqi engineers have attended and successfully completed 6 to 8 weeks training programmes in the Netherlands and Italy.
- Seeds and fertilizers in value of US $ 5.3 million were procured and distributed in early 2005 as an emergency measure. This was a "one shot assignment". During the field survey it was sometime mentioned that many farmers were unable to cultivate their land due high prices of inputs like seeds, fertilizers etc.

  - **Recommendation 5:** FAO should commission a study on the structures and actors involved in the agricultural inputs market in Iraq, their coverage, quality, prices and strengths/weaknesses, to ascertain whether and how the development of the market could be supported in future programmes to provide sustainable, dependable and reasonably priced services to Iraqi farmers.
  - **Recommendation 6:** Appropriate legislation should be prepared and voted into force, so that WUA can be formed in every scheme in Southern and Central Iraq.

General considerations:

Given the security situation in Iraq and absence of a strong Iraqi Government at the time of project formulation/inception, it is understandable that priorities were set opportunistically rather than based on comprehensive needs assessments, which would have been impossible to conduct. Priority setting within the MoWR was a long and tedious process because the Government was newly established.

The cost effectiveness of the pumping stations and irrigation scheme rehabilitation in Central and Southern Iraq is probably quite low. The use of powerful and sophisticated pumping stations to irrigate and drain large Government-built and operated schemes of the Center and South appears not cost-effective, in that one needs to pump water into the schemes and then pump it out of the schemes to limit water logging and salinity, thus requiring large investments and very significant operating expenses. These costs most likely far exceed the economic benefits under the current cropping system, largely dominated by low-profit cereals such as barley and wheat. The situation is different in the north, where the small gravity irrigation schemes are probably much more cost-effective since they require no pumping and can be operated by Water User Associations. The evaluation therefore supports the current

orientation of FAO towards rehabilitating more of these small gravity schemes in the North (120 schemes, mainly about head work and spring collectors).

- **Recommendation 7:** All future projects should have a strong component on training on improved water management and crop production techniques.
- **Recommendation 8:** Security permitting, a technical and economic review of irrigated agriculture in Central and Southern Iraq appears in order to assess more precisely the economic viability of large Government-operated irrigation and drainage schemes, guide future rehabilitation priorities and investment policies, and identify options to improve cost-effectiveness, including improved water efficiency, increased involvement of WUAs in the management of the schemes, lower-cost investment options, and the possibilities to plant higher-value crops.

Just as the evaluation was constrained by poor security in the country, the project implementation and supervision by FAO staff and consultants was also handicapped by the inability of the FAO staff and consultants to travel in South and Central Iraq. FAO partially compensated these constraints by establishing a Steering Committee meeting every two months for 3 or 4 days and including representatives from the MoWR and Iraqi contractors, and by hiring Iraqi engineers through third parties to supervise the projects sites, although their movement was also severely restricted. The supervision of the projects was therefore done by "remote control", not the ideal method but the only approach available under the circumstances.

Although some of these projects were only partially completed, FAO deserves credit for the courage with which it undertook rehabilitation work under extremely trying conditions. When successful, such as in Hutaman, Kirkuk, Al Mussaib, Heran or Mosul, the projects boosted the moral of both the Iraqi government and its people, provided much required drinking and irrigation water, reduced water losses, water logging and salinity and allowed farmers to expand the cultivated area. It is hoped that in future the security situation will improve and project implementation will be much easier and effective.

1. Introduction

At the beginning of 2008, the FAO Evaluation Service (PBEE) was requested to initiate the evaluation of five projects implemented in Iraq from 2004 to 2008 by FAO with funding from the United Nations Iraq Trust Fund (UN ITF):

- OSRO/IRQ/402/UDG - Assessment and rehabilitation of community irrigation schemes and restoration of irrigation water supply in rural areas (US$5.1 ml)
- OSRO/IRQ/403/UDG - Improvement of water supply and drainage provisions through the rehabilitation of pumping stations (US$25.1 ml)
- OSRO/IRQ/404/UDG - Assessment, emergency maintenance and rehabilitation of the community irrigation schemes and restoration of water supply in rural areas (nearly US$17 ml)
- OSRO/IRQ/406/UDG - Restoration of veterinary services in Iraq (US$8.7 ml)
- OSRO/IRQ/407/UDG - Restoration and Development of Essential Livestock Services in Iraq (US$8.5 ml)

The first three projects above (402, 403 and 404) dealt principally with irrigation, drainage and rural water supply. The present report describes the findings, conclusions and recommendations of the evaluation pertaining to these three water-related projects.

2. Methodology

The evaluation was to provide accountability to the Government, FAO and the donors as well as recommendations on the further steps necessary to consolidate progress and ensure achievement of project objectives. Any further need for external assistance was also to be identified. The TORs of the evaluation are presented in the Annex I. The composition of the evaluation mission, key personnel met and the documents consulted by the mission are shown in Annex II.

The evaluation was conducted towards the end of the project life by a team of three international consultants (a Team Leader, an Irrigation Specialist and a Survey Coordinator), complemented by a team of 10 Iraqi surveyors. It used the following methods: document analysis, field survey by the Iraqi surveyors, telephone interviews and individual meetings with available FAO personnel that handled the project. For security reasons the international evaluators were not able to go to Iraq to see achievements on the ground and meet with beneficiaries in person. They had to rely on the Iraqi surveyors to do that, which put significant limits to the depth of analysis and precision this evaluation could achieve.

Secondary information has also been collected from different official records and reports from FAO. The team of international consultants did two missions to Amman, Jordan where the FAO office coordinating the Iraq projects is located: one mission from 19 to 30 September 2008 to train the team of Iraqi surveyors, establish preliminary contact with programme staff in the FAO representation and collect progress reports; and another one from 19 to 30 January 2009 to review the results of the survey, interview the FAO staff in Amman, pass telephone calls to interview key

Iraqi personnel, collect further records and reports, and analyze and present findings to the FAO office.

The field survey was meant to collect primary information from the following sources:

1. Key project implementation partners in the field: FAO personnel (sometimes contracted through third parties), MOWR cadres in Erbil and Baghdad, and the staff of all supported pumping stations. A total of 49 key informants were interviewed both from local and central level. Unfortunately, the surveyors made many attempts to interview senior MoWR staff but the interview was not granted. Further attempt by the team of international consultants to obtain MoWR feedback by telephone and emails were unsuccessful. The MoWR staff in Erbil was much more forthcoming in providing information, but had a limited role in the implementation of those irrigation and drainage projects, mostly targeted at the Center and South of the country.
2. Groups of farmers from the areas served by each pumping station or rehabilitated irrigation scheme, in order to obtain some understanding of the situation before and after the project implementation. Both qualitative and qualitative questions were asked but the emphasis was placed on qualitative aspects. These beneficiary interviews were conducted in the head, middle and tail end areas of the rehabilitated schemes. A total of 8 interviews were conducted with 35 beneficiaries from 4 projects (Heran, Hilla-Hashemia, Hutaman, Kirkuk, Sweira) where a benefit was to be expected in farmers' field given the pumping station and/or irrigation and drainage infrastructure had been repaired or replaced[7]. However and due to prevailing security situation, such group interviewers could not be conducted in all target areas (e.g. interviews with farmers were planned for Mosul and Al Mussaib but could not be conducted).

Based on the objectives of the evaluation, different data collection instruments were developed. The instruments were primarily questionnaires' for beneficiary interview and key informants interview. A group of surveyors was recruited from Iraq and trained in Jordan on data collection techniques using the questionnaires. The questionnaires were also fine-tuned and translated in Arabic in consultation with the surveyors. The questionnaires were pre-tested in a selected site in Jordan.

Field data were collected from 18 Iraqi sites (9 for water-related projects) from 15 October 2008 to 15 December 2008. As the questionnaires were filled in Arabic, they had to be translated in English. English translation was made available by the end of December 2008.

Though one of the objectives of the evaluation was to assess impact of rehabilitation of disadvantaged group like poor and female-headed households, these could not be interviewed.

[7] Surveyors were instructed not to survey farmers in locations where the pump stations were not yet operational at evaluation time. At these locations, farmers interviews would have brought little impact information.

The survey was clearly not a perfect solution to the need for primary information. However, by and large it did provide confirmation of projects impact as well as a good overview of implementation status and constraints. The International Consultants did use telephonic and email communications to verify or clarify some of the data collected by surveyors. This methodology left significant weakness in the quality of data and due to poor security conditions at sites, it was unfortunately not possible to fully measure the impact even where the activities were completed. However, under the circumstances this was the best approach available.

With the improvement of the security situation in projects areas, the MoWR is now taking actions to complete the pumping stations for which it accepted responsibility ("supply-only" stations). Since the evaluation was conducted before such Government action took place, the impact had yet to materialise for supply-only stations at evaluation time. Consequently this report should not be considered as a final evaluation report.

The recourse to satellite imagery was envisaged on selected project sites to try and measure projects impact. The evaluation evidenced that an impact on water logging and cropping patterns could possibly be evidenced in the sites of Hiran, Al Mussaib and Huttaman. So far satellite images have not been procured for this purpose but remain an option to further discuss with the FAO Emergency Division (TCE) and potential suppliers, including the FAO Remote Sensing Division (NRCE).

3. Background

Agricultural production in Iraq depends mostly on irrigation. About 3.3 million ha of arable land in Iraq are equipped with the necessary infrastructure for full or partial water control and supply. Two thirds of this area is fed by gravity supply (through major canal systems controlled by river intakes, diversion weirs etc. or directly from reservoirs), whereas pumping stations are used for one third of the area.

The Ministry of Water Resources controls about 275 major pumping stations in the Euphrates and Tigris river basins. Most of them were built in the 1970s or early 1980s. They house about 1,200 individual pumps with capacities going from 2 m^3/s to 50 m^3/s. Large pumping stations feed major irrigation canals or assure drainage of the irrigated land. Some of the supply canals also provide water to the Water Treatment Plants for domestic use.

But over-irrigation[8] as well as drainage problems (silted canals, non-operational drainage pumping stations, etc.) has caused severe water logging and salinity problems in most of the irrigation schemes built between the Tigris and Euphrates rivers. The shallow water table in the affected areas complicates the management of salinity by restricting leaching of salts through the soil profile.

The topography of the lower part of the country limits technical options for drainage. Although Baghdad is situated at about 700 km from the Persian Gulf, its elevation is

[8] Particularly during the sanctions regime. See: Salt of this Earth, by David Enders, The National, 10 April 2009.

only 36 meter above see level. The construction in the 1980's of the main out fall drain (MOD) collecting drainage waters and discharging them in to the Arab Gulf was an attempt to alleviate the overall drainage problem. However, due to conflict during the last decades many irrigation schemes primary drains could not be connected to the MOD. Sanctions and conflicts during the last two decades have also severely affected the operation and maintenance of irrigation and drainage systems (i.e. canals and pumping stations). The lack of maintenance of drainage canals and the operating problems on many of the drainage pumping stations during the last decades, including severe electrical load shedding during large parts of the day, poor design, lack of maintenance and looting and vandalisms during the latest conflict, have all contributed to further worsening of the drainage problem.

In these irrigation schemes, yields of major crops, wheat and barley, have significantly decreased as a result of salinity and water logging. Large areas of potentially productive agricultural land were left follow, affecting farmers' income. This is one of the factors contributing to the migration of a large section of rural population to cities in search of employment. Damage on drainage-pumping stations may also lead to the contamination of drinking water in downstream areas.

The situation is markedly different in Northern Iraq. In this mountainous area, the irrigated lands are scattered over valleys and use water diverted from springs and streams without the need to pump (gravity irrigation). Most of these small-scale gravity irrigation schemes are managed by communities through Water User's Associations. Unfortunately, some of the infrastructure has been damaged during the eighties and nineties. Recent and recurrent droughts have accelerated degradation. This, coupled with massive food distributions in Northern Iraq for decades, has caused a large section of population to move to the cities.

The Iraqi Ministry of Water Resource (MoWR), following its restructuring after the last war, has placed high priority in reclaiming irrigated agricultural lands from perennial flooding and salinity due to poor drainage.

The MoWR operates some 305 pumping stations in Central and Southern Iraq, and estimated in 2004 that 60% of those were operational while approximately 600 pumps and/or motors in about 125 pumping stations needed to be replaced or substantially repaired. Aware that the overall rehabilitation and modernization of this vast network will be a long and expensive programme, the MoWR prepared a prioritized list of pumping stations needing repair, replacement or complete overhaul of the equipment. Systems supporting drinking water were given first priority and systems supporting major agricultural areas were rated second.

Immediately after the recent war, FAO received funding from the newly established, UNDG-managed Iraq Trust Fund (ITF) as part of the International Reconstruction Fund Facility for Iraq (IRFFI)[9] to implement with the MoWR three emergency

[9] The IRFFI was launched early in 2004 by the United Nations and the World Bank to help donor nations channel their resources and coordinate their support for reconstruction and development in Iraq. The Facility has two trust funds for donor contributions, each with its own characteristics and procedures: the World Bank Iraq Trust Fund, administered by the World Bank Group and the United Nations Development Group (UNDG) Iraq Trust Fund (ITF), administered by UNDP on behalf of

projects on post-conflict inventory and condition assessment of all pumping stations and the rehabilitation of high priority stations.

4. Project Objectives and Design

4.1 Project Description and Objectives

OSRO/IRQ/402/UDG (budget: US$5,126,600):

Development Goals:

- Improving food security for Iraq through increased agricultural production
- Improving livelihoods through increased income and better living conditions

Immediate Objectives:

- Restoration of essential infrastructure for community irrigation and drainage
- Capacity building for Ministry of Water Resources

Outputs and Key Activities:

- The different Ramadi irrigated perimeters connected to the main drainage canal through operational field drains and entrance canals.
- The main Ramadi drainage canal improved and reconstructed to sufficient capacity allowing the discharge of the drainage waters into the Main Outfall Drain, without over spilling in the Thartar outlet canal or other river or canal systems used for drinking water supply.
- Water User Associations created and trained to contribute to the improved operation, maintenance and management of their fields irrigation and drainage networks, in collaboration with the technical institutions
- Local technical institutions strengthened trough training and through the provision of essential equipments for the operation and maintenance of the rehabilitated infrastructure (main drains), as well as for the proper monitoring of both water table and soil / water salinity issues.
- Local technicians trained for weed control in drainage canals
- A network of piezometers installed for monitoring water table and salinity
- Farmers having received additional training in cropping technology to take maximum advantage of the improved drainage conditions

The project was therefore intended to reconstruct the main drainage canal from irrigated areas in Ramadi to the Main Outfall Drain, allowing the discharge of the drainage waters into the MOD without over spilling in other rivers or canal systems used for drinking water further downstream. FAO completed significant preparatory work (feasibility studies, bills of quantities, tenders) for this work, but the project location was subsequently changed to Hilla-Hashimiya (Babylon Governorate) at the request of the MoWR, resulting in an 8-month delay, with associated costs.

Participating United Nations Organizations. As of 30 November 2007, deposits in the UNDP ITF amounted to US$1.274 billion, most of it from the EU and Japan.

The main problem at Hilla-Hashemia was that due to intermittent power supply at the Al-Shomally pumping station used to drain this huge scheme. The main drain had been filled with water for long periods of time and thus silted and overgrown by weeds, resulting in extensive water logging. The project objective was to excavate the main drain on its entire length (50 km) so as to improve drainage and reduce the water table to an acceptable level. Work on secondary drains was left for farmers to undertake after the cleaning main drain. The total area to be reclaimed was estimated at 62,500 hectares (250,000 donum) and 50,000 to 60,000 farming families were to benefit from the project.

OSRO/IRQ/403/UDG (budget: US$25,158,544):

Development Goal:

- Not mentioned

Key Immediate Objectives:

- to make a full assessment of the condition of the pumping stations in the country, and to identify and detail the measures to be taken for their repair or rehabilitation;
- within a priority list, prepared by the MoWR on the needs basis, restore into operational condition up to 125 pumping stations within the Tigris and / or Euphrates hydraulic systems, contributing to the better water supply of some 1,000,000 Ha of agricultural land and 150,000 of households within the areas' rural communities.

Outputs:

- Rehabilitation of up to 125 pumping stations earmarked as priorities, through the local or international procurement of mechanical and electrical equipments and spare parts and their installation;
- MoWR technical staff trained in condition assessment and repair of pumping stations; technical and administrative staff on contractual matters for major international procurements / service contracts;
- A general inventory and condition assessment of the approx. 275 pumping stations under the control of the MoWR, in a GIS-linked database.

While the development objective is not explicitly mentioned in the project document, the document explains that rehabilitating pumping stations will result in "the general population [benefiting] from increased availability of clean water, increased agricultural production and food availability."

As described above, the project was originally intended to rehabilitate 125 priority pumping stations, an estimate not based on any precise needs assessment. A complete and detailed status report for the first 12 priority pumping stations to be rehabilitated was produced, showing that the project would only have funds for these 12 stations. This objective was later reduced to 8 due to cost escalation, with three to be supplied and installed by FAO and 5 to be supplied by FAO and installed by the MoWR. The latter decision was taken in the face of the deteriorating security conditions inside Iraq

and notably in majoritarily Sunni areas, where Iraqi contractors became unable or very reluctant to work.

OSRO/IRQ/404/UDG (budget: US$16,958,942):

Development Goal:

- To improve rural livelihood through the restoration of adequate levels of water supplies in the project areas in order to assure an appropriate level of irrigated agricultural and livestock production and to safeguard water-needs for human consumption.

Immediate Objectives and related outputs:

1. Building up water users' associations as well as strengthening selected government institutions responsible for water management in the country. It is necessary to promote fundamental changes in institutional arrangements and regulations that aim at re-orienting the existing public irrigation institutions towards providing services to farmers on economically sustainable basis and improving their performance in both economic and environmental terms.

   Outputs:
   - An assessment made of the post-conflict capacities and resources available with the central and local authorities, technical institutions, companies earlier in charge of the planning, design, construction, equipment, operation, maintenance and management of major irrigation schemes or areas with major irrigation projects;
   - Key institutions for project collaboration identified and assistance provided where required in strengthening their implementation capabilities;
   - A Water Resources and Irrigation Support Unit (WRISU) established, staffed and operational at both central and regional levels to plan and implement the project together with the local technical institutions and authorities;
   - Water Users Associations (WUA) are formally established and their members meet in regular intervals to ensure adequate maintenance and operation of the rehabilitated irrigation schemes, to discuss water issues and to coordinate all water-related activities;
   - Funding requests prepared by the technical institutions and ready for submission to potential donors for the repair / replacement / restoration of other identified damaged infrastructure-items with a lower rank on the priority-list.

2. The repair/restoration/replacement of a number of irrigation infrastructures and equipment making them again operational, on the basis of a priority list established after a need assessment carried out in close collaboration with the local communities and administrative and technical authorities.

   Outputs:
   - Joint assessments carried out with central and local institutions as well as local communities of the damage to the irrigation infrastructure and

equipment, and their effect on the present and future food availability and water supply to the different population groups in the affected areas;
- A prioritised programme prepared for repair / rehabilitation / replacement of irrigation infrastructure and equipment based on the above joint needs assessments;
- A number of essential infrastructure-items repaired and put again into operation. It is estimated that 70 Km of secondary tertiary canals can be rehabilitated while some 20,000 ha of gravity irrigation schemes can be put back into production;
- conditions created for these irrigation infrastructures to be properly managed and maintained by the users-beneficiaries and /or the concerned local institutions of the Ministries of Agriculture and Water Resources;

3. Replace/repair malfunctioning parts of equipment to enable the safe water treatment and pumping units to operate at their designed operational capacities in order to provide water in deprived communities.

   Outputs:
   - Joint assessments carried out with central and local institutions of the damage to the Water treatment/distribution infrastructure and equipment, and their effect on the present and future food availability and water supply to the different population groups in the affected areas
   - A prioritised programme prepared for repair / rehabilitation / replacement of water treatment/distribution infrastructure and equipment based on the above joint needs assessments
   - A number of essential infrastructure-items repaired and put again into operation
   - Conditions created for these safe water distribution infrastructures to be properly managed and maintained by the local communities;

4. Promote the adoption of technological innovations among irrigation farmers with a view to achieving greater efficiency in the use of water and soil resources and increasing agricultural production.

   Outputs:
   - Extension workers and key farmers are aware of the significant potential for reducing conveyance and on-farm water losses during irrigation;
   - Farmers (male and female), and other community members trained on effective irrigation water management and efficient irrigation water use;
   - Availability of natural resources (land and water) will be increased through its more efficient use.

5. Improve the livelihood of the people living in the Project area by creating rural employment opportunities and raising incomes.

   Outputs:
   - Improved Health of communities due to provision of safe water and drainage
   - Support to agricultural and livestock production through the provision of inputs
   - Increased agricultural and livestock production due to increased water availability

- Short term employment opportunities created by the infrastructure rehabilitation component
- Long term employment opportunities created as consequences of above mentioned outputs

Five potential project sites for this project were identified by the MoWR in 2004. Soon after technical dossiers were completed, it was realized that the costs were substantially higher than envisaged and the project was refocused on the following four sites: Heran and Kalar in Northern Iraq were selected for construction works while Al Mussaib and Al Thraina in Central and Southern Iraq were selected for rehabilitation works. Detailed situation map, pre-feasibility and feasibility studies, technical dossiers which included description of the works, estimated costs and justification of the envisaged works were completed. Two of these would later be dropped: Kalar because the topographic survey submitted by the MoWR in Erbil was incomplete while security and a limited budget did not allow a new detailed topographic survey, and Al Thraina due to a request by the MoWR to replace the project by the urgent procurement of grouting machines for the Mosul Dam.

This project therefore undertook three main works:

- The rehabilitation of the Heran gravity irrigation scheme located in northern Iraq. It has a command area of 145 ha and is inhabited by 180 farming families but significant loss of water from unlined canals reduced the command area to 96 ha. This component project was implemented from June 2005 to January 2006 at the very modest cost of US$ 216,546.
- The rehabilitation of the Al Mussaib irrigation scheme (3,000 ha; 2,500 farming families), including a new pumping station, the rehabilitation of a major drain (Drain 22) as well as canal lining and feeder roads. This component was implemented from June 2006 to March 2008 at the cost of US$2.9 million.
- The supply of grouting equipments for the large Mosul Dam, where foundations require continual grouting to maintain the dam's stability. The dam is Middle East's fourth largest dam in reservoir capacity and Iraq's largest. It was originally constructed over multi-strata of gypsum, limestone and clay. Gypsum is a water-soluble mineral susceptible to seepage. Subsequent erosion creates cavities beneath the dam that must be plugged or "grouted" on a regular basis or the whole structure will break open, resulting in hundreds of thousands of casualties in Mosul town and further south. The dam design fortunately includes galleries for grouting, but regular grouting work was negatively affected by the sanction regime and subsequent lack of replacement grouting equipment. In 2004, the Coalition Provisional Authority commissioned a study, which concluded that continuing with the grouting programme was the only practical option, and that the grouting programme had fallen behind in recent years due to the lack of drills in good operating conditions[10]. The study recommended introducing additional machinery so that grouting could be increased to the desirable rate. In 2006, as requested by the MoWR, FAO agreed to purchase six diesel hydraulic crawler

[10] The study, conducted by Black and Veatch and Washington Group International, estimated that drilling operations were at about 50 percent and grouting between 15 percent and 50 percent of 1987 levels.

rings type B1-800[11]. This component was implemented in 2006 at the cost of US$ 2,850,000.

4.2 Design Issues

Most of the issues pertaining to project design are common to all the three projects and are jointly described below.

A rapid project planning phase

This first batch of UN ITF projects was prepared and approved very rapidly in 2004, under significant political pressure exerted on the UN to start working in "post-war" Iraq. The planning assumption was that ample flexibility would be left during implementation to adapt the project objectives and priorities to a rapidly changing environment.

Perhaps as a result of this rapid planning phase, the projects tend to have fairly generic development objectives, or none at all (403). Besides, the immediate objective 5 of project 404 and its corresponding outputs constitute a series of development objectives to be achieved by the completion of immediate objectives 1 to 4.

Technical bias

The projects aimed at restoring pumps, irrigation and drainage schemes, and the likes. Projects objectives were therefore largely phrased in technical terms with little attention to the management and economic sustainability of the schemes once repaired. Similarly, a very detailed risk assessment conducted in 2005 for project 403 envisaged only technical and operational risks ("incompatibility of new equipment with existing equipment and to the existing pump station infrastructure" and "poor installation of new equipment and inadequate care taken during the rehabilitation of pumping stations")[12].

There are exceptions to this. In project 404, immediate objectives 1 and 4 had a socio-economic dimension (creation of Water User Associations and promotion of technological innovations among farmers). Project 402 includes two similar outputs ("Water User Associations created and trained to contribute to the improved operation, maintenance and management of their field irrigation and drainage networks, in collaboration with the technical institutions"; and "Farmers having received additional training in cropping technology to take maximum advantage of the improved drainage conditions"). These socio-economic objectives were not given a high priority by the MoWR during implementation – in fact they were not implemented – but at least project planners were aware of the need for a more

[11] Similarly to the approach taken with pumping stations, it was decided to procure the model that Iraqi engineers were already familiar with and which had proven durable and effective under the very specific operating conditions of the Mosul dam.

[12] Risk Management, Improvement of Water Supply and Drainage Provisions Through the Rehabilitation of Pumping Stations, Project No. OSRO/IRQ/403/UDG, January 2005.

participatory approach to water rights management, as well as for improved economic profitability of these costly irrigation schemes.

Assumptions and risks

Detailed work plans were prepared and presented in the project documents. But the plans could not be implemented as per schedule due primarily to factors beyond the control of the project personnel. The main risk envisaged in the project documents was, rightly, the security situation in the country. Other envisaged risks included processing delays on the part of the government agencies and non-availability of the machinery and equipments within the country. The processing delays were primarily influenced by the inability or unwillingness of the officials to take decisions in a very fluid and uncertain socio-political and security situation.

Though the risks from uncertain socio-political and security situation was predicted to a considerable extent, procurement and transport delays, inability of the international staff to travel to Iraq for proper supervision of the project, restricted supervision by national staff due primarily to security situation and also the risk of being identified as a collaborator of the occupation force, the inability of the contractor to pre-finance the operations and mobilize men and materials, etc. could not be fully assessed at project design stage.

4.3 Relevance

The three projects as designed were quite relevant. Reconstructing a national food production capacity in Iraq, fighting salinity and water-logging, trying to support farmers' income, re-vitalising the Iraqi rural economy and improving the quantity and quality of drinking water were all very relevant goals. In the case of the Mossul dam, the aim of the concerned project component was to ensure the structural stability of the dam and hence not only the continuation of its irrigation role but also avoid hundreds of thousands of casualties – a very relevant intervention in the absence of any practical long-term alternative solution to the dam structural problems.

However, the projects were predicated on a rapid return to a state of law and order to allow for close supervision by FAO staff at project sites, as well as on a swift resumption of such basic utilities as electric power supply. All the repaired or replaced pumping stations rely on electrical power and hence on the national grid. In actual fact, the assumption that the Iraqi electric power supply system would rapidly spring up after the war proved false, but it was a reasonable assumption to make in 2004. Besides and in case of temporary problems, all the pumping stations were to be supplied with back up generators. Again, in retrospect it appeared that these backup generators often lacked fuel to operate, but who could have predicted in 2004 that a country like Iraq would find itself with a recurrent shortage of fuel?

The case of the Hilla-Hashemia drain is more problematic. The silting of the drain was only a symptom of a deeper problem which was that the Al Shomally pumping station was slowly broking down and incapable of dewatering the drain. Cleaning and

enlarging the drain before the repair of the pumping station amounted to placing the cart before the horse.

At the policy level, trying to reform the way these massive state-owned irrigation schemes are being managed by promoting Water User Associations (WUAs) was also very relevant. The idea that the new Iraq should be different from the old one, more democratic and less top-down, was after all presented as a central war goal for the "coalition of the willing". Unfortunately, experience showed that old habits of state officials die hard. In retrospect, assuming that such a momentous change could have been achieved (or even kicked off) simply by training farmers and MoWR officials comes across as rather optimistic. The first point of call should have been a reform of the legislation in Central and Southern Iraq so that it defines a clear role for WUAs there.

5. Management and Implementation Status

5.1 Management and Institutional Arrangements

The projects were implemented from the FAO Project Management Unit. This Unit, initially located in Iraq, was relocated to Amman when the UN decided to leave Baghdad as a result of the Canal Hotel bombing in 2003. The three projects started in 2004 and were therefore designed, managed and monitored by FAO from its Amman office in Jordan, initially under the assumption that security would improve and allow for closer supervision by FAO staff at project sites.

The three projects had a Chief Technical Advisor (CTA) based in Amman. He was assisted by a National Project Coordinator. FAO issued contracts with companies for civil, mechanical and electrical expertise in Iraq. The contract included i) feasibility study, bills of quantities and tender documentation design, ii) technical supervision of works carried out by contractors in Iraq and iii) monitoring and reporting. This third-party independent expertise was required to review, verify and analyse information received from Government counterparts, or in many cases to generate the information not provided by Government counterparts.

As part of this effort, FAO hired one Resident Engineer in each and every project location. Monitoring of the project was undertaken by the Resident Engineers together with MoWR personnel at each pumping station, who provided weekly reports consisting of photographs and certified technical updates. The progress evaluations were based on this photo and video evidence that was consolidated into monthly reports. Together with these reports, work updates from the contractor in accordance with the BoQ, formed the basis for payment advice.

All contracting and procurement procedures were done as per standard FAO procedures. However, the MoWR shared with FAO the full responsibility for the implementation of the projects, deciding on the locations, the equipment to procure, nominating experts for international trainings, and participating in the tendering

process[13]. Unlike for projects implemented with the MoA, no focal point was appointed by the MoWR to liaise with FAO, thus causing serious delays.
Progress of implementation was therefore monitored by FAO from the Amman office in Jordan. This system, popularly known as "supervision by remote control", where monitoring is principally done by telephones, emails and periodic coordination meetings with the counterpart staff from government agencies, contractors and suppliers, was the only possible option under the circumstances.

However, it can be best described as less than adequate for at least two reasons:

1. FAO managers were to a large extent dependent on governmental staff for information, although an effort to hire resident engineers through third party companies alleviated this concern. The system worked reasonably well, at a significant cost.
2. On a more psychological plane, managers find it hard to maintain motivation and a sense of urgency when they cannot access and talk to the people they are working for (see Text Box).

> "The point here is not that aid workers in such settings are not making important contributions – many certainly work extremely hard and make every effort to stay connected to beneficiary communities across the geographic and psychological gaps. But the quality of the contributions made by remote managers can suffer because the emergency mindset that comes from living and working among people in need is more difficult to maintain at a distance."
>
> *Iraq: more challenges ahead for a fractured humanitarian enterprise, By Greg Hansen - Feinstein International Center - December 2008*

FAO partially compensated these constraints by establishing a Steering Committee meeting every two months for 3 or 4 days and including representatives from the MoWR and Iraqi contractors[14]. This forum allowed for regular stock-taking of implementation progress, planning of further steps and the resolution of differences of appreciation between stakeholders.

5.2 Project budgets and Expenditures[15]

OSRO/IRQ/402/UDG

A total of US$5,367,300 was originally allocated from the UNDG Iraq Trust Fund (ITF) for this project, reduced to US$5,126,000 in 2007[16] to take into account implementation progress and likely expenses at the end of the project.

[13] In August 2004, FAO signed a written agreement with its key counterpart ministries, to insure a strong involvement of the ministries involved in the procurement process, including in the preparation of detailed specifications, listing local potential suppliers to be invited to bid in addition to international ones, technical review of the offers received and selection of the winning bid.
[14] While most of the equipment was purchased abroad, installation works were sub-contracted to local Iraqi civil contractors who were familiar with the local authorities and who could work under the prevalent security situation.
[15] The budget and expenditure figures are based on the project document, the project accounts and available reports, including final report written by the CTA. All data in US$, expenditures as of 26 march 2009.
[16] Budget Revision dated 5 December 2007.

As of 26 March 2009, 99% of the budget have been spent or committed. At the same date, unsettled commitments amounted to US$ 625,572, i.e. 12% of all committed and spent funds (actual expenditures: US$4,444,107, total committed and spent: US$5,069,679). The unsettled commitments were related to yet unpaid work to the contractor hired for the enlargement and remodelling of the Hilla-Hashimia main drain (Al-Hadi Engineering Co). A part of this sum may ultimately be cancelled due to termination of the contract before the end of the work (see section 5.3 Implementation Progress and Status).

Table 1: Expenditures (actuals and hard commitments) per organizational unit and account - OSRO/IRQ/402/UDG

Account	FAO Rep office in Amman	HQ Emergency Division	HQ Admin. (Administrative and Finance Department)	Total
5011 Salaries Professional	-	280,442	-	280,442
5012 Salaries General Service	-	-	-	-
5013 Consultants	18,918	148,991	-	167,909
5014 Contracts	52,136	2,085,119	625,572	2,762,827
5020 Locally Contracted Labour	218,452	2,696	-	221,148
5021 Travel	111,640	67,549	-	179,189
5023 Training	31,935	50,606	-	82,541
5024 Expendable Procurement	26,222	897	-	27,119
5025 Non Expendable Procurement	19,273	704,093	-	723,367
5027 Technical Support Services	-	12,772	-	12,772
5028 General Operating Expenses	254,623	65,724	-	320,346
5029 Support Costs	51,324	239,412	-	290,736
5040 General Overhead Expenses	-	1,144	-	1,144
5050 Chargeback	-	140	-	140
Grand Total	**784,523**	**3,659,584**	**625,572**	**5,069,679**

Overall, FAO Headquarters processed 84.5% of all expenses (72.2% by the Emergency Division and 12.3% by the Administrative and Finance Department). Expenses incurred by the local FAO offices in Amman and Erbil represent only 15.5% of total expenditures, but they are significant for a few budget lines: Locally Contracted Labour (99%), Travel (62%), Training (39%), and Expendable Procurement (i.e. supplies and commodities, 97%).

There is minor discrepancy between these data, extracted from project corporate accounts (Oracle), and the financial data presented in the final report for the project. These are related to the budget item which the data in presented, given that the UNDG account nomenclature is different from the one used by FAO, as follows:

- The contract with Cranfield University (US$167,228) for the delivery of a training course on managing, operating and maintaining irrigation and drainage systems is taken out of "contracts" and appropriately presented under "Training" in the final report.

- Security costs in Baghdad, Amman and Erbil (US$71,143) accounted under General Operating Expenses and General Overhead Expenses in Oracle are appropriately presented under “Security costs” in the final report.
- US$12,772 of technical support is lumped under "Support costs", and additional support costs (US$30,089) are added to the Oracle amount – this additional support cost explains the discrepancy in total expenses between Oracle and the final report which states US$5,099,267 of total expenditures.

The changes above are minor in size and intended to better reflect the actual types of expenses incurred. All financial reports submitted to UNDG were cleared by the FAO Central Accounting Service (AFFC) and presented in the most transparent manner.

A total of US$3,513,312 worth of equipment and contracts were procured, mostly through the regular competitive bidding process. Local and regional suppliers and contractors were invited to submit their proposals but technical competency was the main selection criteria. The largest contract (enlargement and remodelling of Hilla-Hashimia drain) went to an Iraqi contractor. The main suppliers of the project are listed in Table 2.

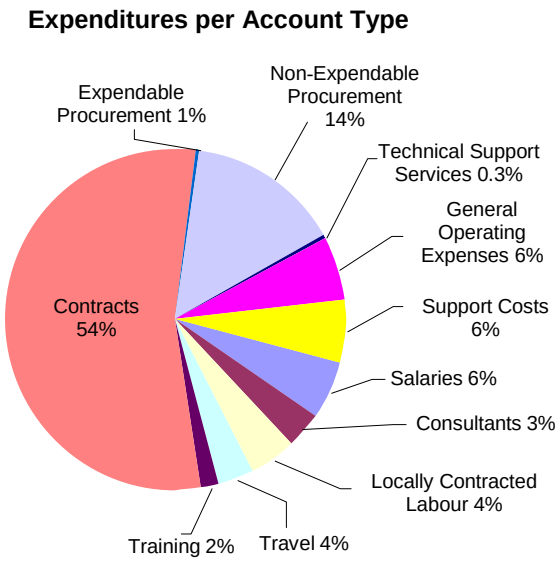


Table 2: Largest vendors / contractors - OSRO/IRQ/402/UDG

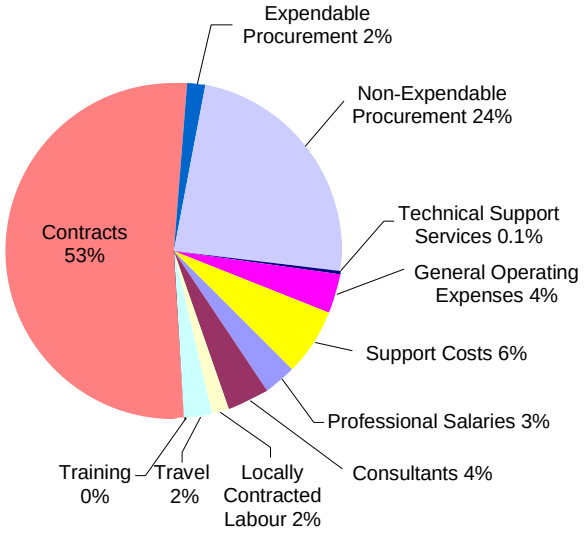
Vendor / contractor	Goods and Services	Total Payments (US$)	
		Actual Payments	Hard Commitments
Al-Hadi Engineering Co (Ltd)	Enlargement and remodelling of Hilla-Hashimia drain	1,932,874	625,572
Amman Cash Vendor	Various cash transfers and payments	832,730	
Universal Equipment Ltd	2 Water Tankers of 16,000 litres type Euro-Trakker AD380 T38H	242,812	
Iveco Spa	2 (or 4?) Tipper Trucks (6x4WD) with left hand drive and two sets of spare parts and associated transport costs to Aqaba Port	203,563	
Baghdad Cash Vendor	Various cash transfers and payments	193,199	
Cranfield University	Organization/delivery of training course in UK on managing, operating & maintaining irrigation & drainage systems	167,228	
Sigmainvest Ltd	?	150,000	
Bahrah Trading Company	1 Hitachi hydraulic excavator - ZX230	134,509	
Antemina International Llc	IVECO Fuel tanker - 16000 litres	123,041	
Kuhne & Nagel A/S	Transport of procured items to Iraq	61,726	
Consolidated Consultants Engineering & Environment	Preparation of Technical Dossier for Hilla-Hashimia Irrigation Scheme	56,200	

OSRO/IRQ/403/UDG

A total of US$25,158,544 was allocated from the UNDG Iraq Trust Fund (ITF) for this project, in two allocations: a first one of US$13,463,000 granted at project inception, and a second of US$11,695,544 granted in November 2005. As of 26 March 2009, 97.3% of this budget had been spent or committed. Resources unspent amounted to US$670,902. At the same date, unsettled commitments amounted to US$1,097,534, i.e. 4.5% of all committed and spent funds (actual expenditures: US$23,390,107, total committed and spent: US$24,487,642).

The unsettled commitments were related to yet unpaid work to varied contractors hired for the rehabilitation of the pumping stations.

Expenditures per Account Type



All financial reports submitted to UNDG were cleared by the FAO Central Accounting Service (AFFC) and presented in the most transparent manner.

Deliverables (procurements and contracts for the rehabilitation of pumping stations) represent 79% of all expenditures. While the project included an output for the training of MoWR technical and administrative staff, minimal expenditures are recorded in the training budget line. Progress reports mention only "on the job training".

Table 3: Expenditures (actuals and hard commitments) per organizational unit and account - OSRO/IRQ/403/UDG

Account	FAO Rep office in Amman	HQ Emergency Division	HQ Admin. (Administrative and Finance Department)	Total
5011 Salaries Professional	-	654,886	73,307	728,193
5013 Consultants	92,062	922,742	-	1,014,804
5014 Contracts	80,432	12,780,994	-	12,861,426
5020 Locally Contracted Labour	462,793	788	-	463,581
5021 Travel	111,666	448,303	-	559,969
5023 Training	8,946	-	-	8,946
5024 Expendable Procurement	60,806	385,230	-	446,036
5025 Non Expendable Procurement	92,034	5,760,825	-	5,852,859
5027 Technical Support Services	-	32,476	-	32,476
5028 General Operating Expenses	885,348	96,489	-	981,837
5029 Support Costs	125,157	1,398,555	5,131	1,528,843
5040 General Overhead Expenses	-	2,717	-	2,717
5050 Chargeback	-	5,955	-	5,955
Grand Total	**1,919,245**	**22,489,959**	**78,438**	**24,487,642**

Table 3 above indicates that 92% of all expenditures and commitments were processed at Headquarters, usually by TCE. Local outlays effected by the office in

Amman are limited to accounts 5020 Locally Contracted Labour, 5023 Training and 5028 General Operating Expenses (for which they represent almost 100% of all expenses).

The main suppliers and contractors of the project are listed in Table 4.

Table 4: Largest vendors / contractors - OSRO/IRQ/403/UDG

Vendor / contractor	Goods and Services	Total Payments (US$)	
		Actual Payments	Hard Commitments
KSB Aktiengesellschaft	Equipment for the rehabilitation of Pumping Stations of Hutaman, Al-Hussainiyah and Salman Pak	6,625,263	301,182
Sigmainvest Ltd	Manufacture, installation and commissioning of equipment for rehabilitation of the Mandeli 1 Pumping station, various ancillary works & two year warranty period	4,184,853	93,625
Andritz Ag	Equipment for rehabilitation of North Suwira Pumping Station + rehabilitation of Al-Amiriyah pumping station	4,067,343	-
Amman Cash Vendor	Various cash transfers and payments	1,384,890	
Consolidated Consultants Engineering & Environment	Engineering and contractor monitoring services for rehabilitation of Hutaman, Al-Hussainyah, Salman Pak, Al-Sijillah, North Suwira, Al-Amiriyah, Mandeli 1, Al Mussaib/Drain 22	933,529	3,817
SPP Pumps Ltd	Pumping Equipment for the Rehabilitation of Al Sijillah Pumping Station	560,358	-
Standard Chartered Cash Vendor	Various cash transfers and payments	450,588	
Baghdad Cash Vendor	Various cash transfers and payments	388,855	
Ai-Imdad Engineering Services Co Ltd	30KvA diesel generators, digital controls & related freight cost	-	373,920
Litostroj E.I.	Oil pressure device 125 bars for PS1 & PS2, Kirkuk	373,880	-
Al-Hadi Engineering Co (Ltd)	Additional works for Rehabilitation and Construction of Al Musseib Irrigation Scheme	28,977	299,716
Rafic Ghazaoui & Co Sal	Autotransformer 6kV, s c imped-0.62/ph at 4500V vector group symbol III, PS2	308,800	-
Regional Observation Center (Roc)	Training in GIS for Water Resource Management of MoWR (held in Jordan)	146,300	-
Areva T & D	30 Vacuum contactors	114,000	-
Kuhne & Nagel A/S	Transport of internationally procured items to Iraq	97,476	-
Erbil Cash Vendor	Various cash transfers and payments	90,743	
Fag Kugelfischer Ag & Co Ohg	Ball bearings	66,793	-

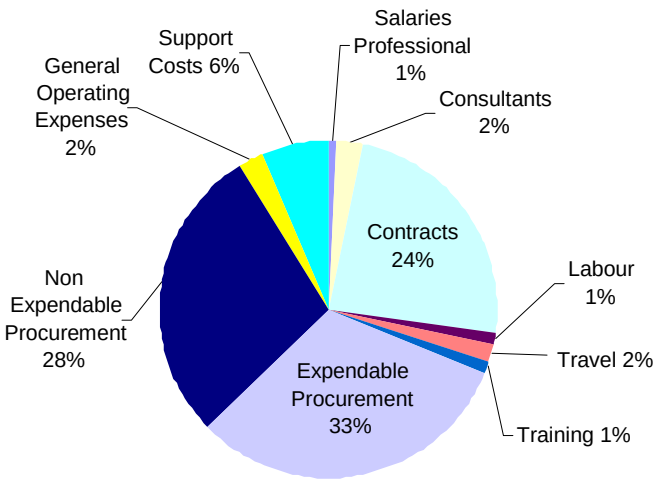
A total of US$19,160,321 worth of equipment and contracts were procured. The procurement of mechanical and electrical equipment for the rehabilitation of the pumping stations was mainly undertaken by direct procurement to the original equipment manufacturers to reduce the need to modify the foundations of the pumping station and to simplify/accelerate the installation process by simply unbolting and bolting on the new pump to the existing mounts. The approach was thus to replace the pumps with exactly the same type of equipment. However, in all cases, equipment to be replaced had to be manufactured to order, as original models were not in production anymore.

Taking into account the risks of further cost escalation due to the recourse to sole-source contracting, the concerned FAO units (procurement service and emergencies division) made every effort to negotiate the prices submitted by the sole bidder for each pumping station, which in some cases were cut by more than 40%. Besides, by contracting the original manufacturer, pumping stations could be rehabilitated without additional civil works, which are very costly in nowadays Iraq.

OSRO/IRQ/404/UDG

A total of US$16,958,942 was allocated from the UNDG Iraq Trust Fund (ITF) for this project. As of 26 March 2009, 99.4% of this budget had been spent or committed. Resources unspent amounted to US$95,736. At the same date, unsettled commitments amounted to US$146,638, i.e. 0.9% of all committed and spent funds (actual expenditures: US$16,716,568, total committed and spent: US$16,863,206).

Expenses per Account Type



The unsettled commitments were related to yet unpaid work to Al-Hadi Engineering for the rehabilitation of the Al Mussaib pumping station and irrigation scheme (US$134,925).

Table 5: Expenditures (actuals and hard commitments) per organizational unit and account - OSRO/IRQ/404/UDG

Account	FAO Rep office in Amman	HQ Emergency Division	Total
5011 Salaries Professional	-	151,908	151,908
5013 Consultants	71,004	315,999	387,003
5014 Contracts	19,500	4,022,169	4,041,669
5020 Locally Contracted Labour	177,774	-	177,774
5021 Travel	63,472	248,963	312,435
5023 Training	-	196,033	196,033
5024 Expendable Procurement	36,562	5,278,403	5,314,965
5025 Non Expendable Procurement	8,468	4,773,518	4,781,986
5027 Technical Support Services	-	2,031	2,031
5028 General Operating Expenses	331,375	70,887	402,262
5029 Support Costs	49,571	1,043,858	1,093,429
5040 General Overhead Expenses	-	1,710	1,710
Grand Total	757,728	16,105,478	16,863,206

Table 5 above indicates that 96% of all expenditures and commitments were processed at Headquarters by TCE. Local outlays effected by the office in Amman are limited to accounts 5020 Locally Contracted Labour and 5028 General Operating Expenses (for which they represent almost 100% of all expenses).

Budget line 5023 Training accounts for only 1.2% of all expenditures, but this is an artefact since US$310,425 worth of contracts with the UNESCO Institute for Water Education (Delft, the Netherlands), AlTerrra-ILRI (Wageningen University, the Netherlands) and the Instituto Agronomico Mediterraneo (Bari, Italy) for the delivery of training courses on hydrology, drainage and land reclamation and design of modern irrigation systems, respectively are accounted for under account 5014 Contracts. Including these contracts, training consumed 3% of all project expenses.

All financial reports submitted to UNDG were cleared by the FAO Central Accounting Service (AFFC) and presented in the most transparent manner.

A total of US$14,138,621 worth of deliverables (equipment and contracts) were procured, representing 84% of all expenditures. The main suppliers of the project are listed in Table 6.

Table 6: Largest vendors / contractors - OSRO/IRQ/404/UDG

Vendor / contractor	Goods and Services	Total Payments (US$)	
		Actual Payments	Hard Commitments
Wirth	6 drilling rigs and spare parts	2,850,000	-
National United Trading And Invest Co Llc (Nutico)	7,750 MT of DAP fertilizer and freight costs (344$/MT)	2,681,003	-
Sigmainvest Ltd	Rehabilitation of Pumping Station at Al Mussaib & repair of collapsed bank of the intake basin	2,596,847	11,434
Ard (Unifert) Sal	468 MT of maize seed (variety Tietar, 5550$/MT)	2,597,400	-
Aquarius Systems	Weed harvesters (2 of 20 m3, 1 of 10 m3), 2 collection barges, 2 shore conveyor, 3 transport trailer and spare parts + training in USA for 3 people	1,306,166	-
Amman Cash Vendor	Various cash transfers and payments	817,485	
Al-Hadi Engineering Co (Ltd)	Rehabilitation of Al Mussaib Irrigation Scheme	387,815	134,925
Al Sudoof Co Arab Traders Inc	Survey instruments and war risk insurance	395,744	-
Consolidated Consultants Engineering & Environment	Pre-feasibility Study and technical dossier for Al-Thirema Irrigation Scheme; feasibility study and engineering supervision on Al Mussaib and feasibility study on Kalar irrigation scheme	277,439	-
Kuhne & Nagel A/S	Transport of internationally procured items to Iraq	218,387	-
Dizayee Company	Construction & Rehabilitation of Hiran irrigation project, Erbil Governorate	196,501	-
Erbil Cash Vendor	Various cash transfers and payments	166,004	
AlTerrra-ILRI, Wageningen University	Course on "Soil, Drainage and Land Reclamation" for Iraqi MoWR staff	125,000	-
CIHEAM Instituto Agronomico Mediterraneo	Training course on planning and design of modern irrigation systems for 10 MoWR staff	93,511	-
UNESCO IHE, Institute for Water Education	Training course on hydrology for 10 Iraqi staff	91,914	-

5.3 Implementation Progress and Status

All projects met with extreme difficulties during implementation, including difficult relations with the MoWR and poor security conditions, often exacerbated for long periods of time, at most project sites. Sometimes, even Iraqi contractors and engineers from outside the immediate neighbourhood of a scheme were not allowed to enter the area for long periods of time. The only project location in a relatively safe zone was Hiran in the North. Poor security also resulted in the withdrawal of all UN agencies to Amman and hence the remote management of projects.

Implementation progress will be described first for the infrastructure components specific to each project. The next sections will describe the implementation of the "software" components, such as training or the constitution of WUAs, which are best analysed at the level of all three projects taken together.

OSRO/IRQ/402/UDG

Initially the project was intended for the Ramadi main drain, for which FAO completed significant preparatory work (feasibility studies, bills of quantities, tenders). However, a local contractor for the civil works for the Ramadi Drain project was appointed by the MoWR before the project start in July 2004. The MoWR wanted FAO to channel funds to MoWR so that they could continue and finalise the contract. Such procedure being unacceptable for FAO, the project site was changed to Hilla-Hashimiya (Babylon Governorate) at the request of the MoWR. This resulted in an 8-month delay with associated costs.

The main problem at Hilla-Hashemia was that due to intermittent power supply at the Al-Shomally pumping station used to drain the scheme, the main drain had been filled with water for long periods of time and thus silted and overgrown by weeds, resulting in extensive water logging in the surrounding scheme. The project objective was to excavate the main drain so as to improve drainage and reduce the water table to an acceptable level. The total area to be reclaimed was estimated at 62,000 hectares and 50,000 to 60,000 farming families were expected to benefit from the project.

After commissioning the feasibility study for Hilla-Hashimiya, FAO issued the tender for the excavation work on the main drain in November 2005 and awarded the contract to an Iraqi contractor, Al-Hadi Engineering & Co, in December 2005. The work involved removal of 2 million m^3 of silt from 50 km stretch of the canal.

In March 2006, lightening destroyed the main electrical transformer for the Al-Shomally pumping station which de-waters the Hilla-Hashimia drain. Consequently the drainage pumps were inoperable and the main drain could not be de-watered and excavated. The MoWR installed two generators, repaired the electrical system with project support[17] and supplied the fuel to run the generators. Due to this initial delay, the contractor started the contract in September 2006, two years after the project inception.

[17] At the cost of US$237,287 – see Project Final Implementation Report, from which most of this historical information is borrowed.

After one year of work, the pumps at the Al-Shomally pumping station broke down, which meant that the drainage canal could no longer be dewatered to facilitate excavation work. This pumping station often works using two out of the three available pumps because one of the pumps, which are twenty-eight years old, is under the maintenance. The water level required for works was regularly exceeded partly due to the malfunctioning of the pumps.

The contractor tried to pump with his own means but did not succeed. The government issued the contractor a permit to lift 150,000 litters of kerosene per month. But due to persistent delay in execution of the work the permit was cancelled. By then, 36.5 km was excavated, i.e. 73% of the intended 50 km. Total excavated materials amounted to 1.7 ml m^3 or 85% of the total contract quantity.[18] Since the contractor could not work anymore, FAO ended the contract. The remaining 13.5 km canal was than handed over to MoWR for cleaning.

Under project 403, FAO conducted a feasibility study for the rehabilitation of the Al-Shomally pumping station, which the MoWR said it could not repair. The estimated cost (US$6 ml) exceeded resources available to FAO at that time.

The MoWR took responsibility for the remaining works and in 2009 contracted the supply of three new pump sets which should be commissioned in 2010. The cleaning of the remaining part of the main drain will follow the installation of the pumps.

The project also procured the following machinery and equipments in support of the MoWR capacity:

- 1 Hydraulic Excavator
- 4 Tipper Truck
- 2 Water Tanker (16000 liter capacity)
- 1 Fuel Tanker (16000 liter capacity)
- A certain number of piezometers for monitoring water table and salinity, which unfortunately have not been installed yet

➢ **Recommendation 1:** The network of piezometers should be installed without further delay and FAO should work out a plan with the MoWR to that effect. As most of the irrigation projects in the country suffer from the twin problems of water logging and salinity, such monitoring is extremely important for proper management of the water table and soil and water quality for agricultural production.

OSRO/IRQ/403/UDG

The project was originally intended to rehabilitate 125 priority pumping stations, but this figure soon appeared unrealistic. At the first Project Implementation Meeting held in Amman from 14 to 18 August 2004, the MoWR and FAO agreed to restrict the number of pumping stations to be rehabilitated under this project. A complete and detailed status report for 12 first priority pumping stations was produced and shown

[18] The discrepancy between those two rates of achievement is due to higher-than-expected siltation in the drain.

that the project resources available at that time (US$13,463,000) would be sufficient for the rehabilitation of only four of these pumping stations. Supplementary funds were requested from the ITF, which made available an additional US$11.65 million to allow the project to complete four more stations. Four of the 12 surveyed stations were left unfunded[19].

In 2007, the MoWR requested that Al Shomally pumping station[20] be rehabilitated as a priority utilising the remaining savings. Detailed condition assessment surveys were completed for Al Shomally and Abu Subkha (also identified as a priority by the MoWR). A tender was issued to Sigmainvest for Al Shomally but the offer received exceeded the residual funds.

FAO started the necessary procurement process for the 8 funded pumping stations in 2005 and awarded contracts in mid-2006. The equipment was delivered towards the beginning of 2007. Poor security conditions in the centre of the country resulted in the Iraqi contractors being unable to install the procured equipment for four stations (Al Amiriyah, Al Sejilah and Salman Pak, North Suweira). It was then agreed that the equipment for these stations would be supplied by FAO to the MoWR for storage until it could be installed under MoWR supervision. This installation work by the MoWR for these stations (marked as "Supply Only" in Table 7 below) was not started at evaluation time.

The implementation status of the eight pumping stations is presented in Table 7 below.

[19] New Suweira (Wasit Governorate), Nahar Saad (Missan Governorate), Abo Bushut (Missan Governorate) and Al-Rumatha (Al-Muthanna Governorate).
[20] Dewatering the Hilla-Hashemiya drain – see section on OSRO/IRQ/402/UDG.

Table 7: Pumping Stations Rehabilitated with Project OSRO/IRQ/403/UDG

Location	Governorate	Delivery Type	Equipment Supplier	Direct Cost to the Project †	Command Area (Ha)	Number of Farming Households	Nb of Pumps	Capacity of PS (m3/s)	Cap. of Each Pump (m3/s)	Context and Status
Al Amiriyah	Anbar	Supply only	Andritz	1,688,159	11,250	2,000	5	7	1.75	Pumps were procured and delivered to Baghdad but initially could not be installed due to very poor security. MoWR have begun installation at the beginning of 2009. Old pumps not functioning.
Al Huseiniah	Babel	Supply & install	KSB	1,804,447 +	25,000	5,000	3	2.5	1.28	Pumps procured and installed by FAO, could not be operated do to faulty electric motors bearings producing much vibration. Expected benefits from the project not derived yet. The motors have been taken to Baghdad for repairs and the necessary spare parts provided free of cost by the supplier (KSP) in March 2009. The motors are being repaired with new bearings and will be installed shortly.
Salman Pak	Baghdad	Supply only	KSB	3,994,219 +	45,750	10,000	5	6.8	1.7	Pumps were procured and delivered to Baghdad but could not be installed due to poor security. MoWR to install. 2 old pumps are operating 6 hours a day.
Huttaman	Dhi-Qar	Supply & install	KSB	1,127,779 +	3,250	372	3	1.6	0.8	Successfully completed. Pumps installed in September 2008 presently operating for 15 hours a day, which has significantly reduced water logging and salinity and increased cultivated area to 3,200 ha (12,800 donums).
Mandeli 1	Diyala	Supply & install	Sigmainvest	3,815,836	12,500	5,000	5 (3+2)	4.5 (2.7+1.8)	0.9 & 1.8	Very dangerous area. New pumps delivered on site, installed and handed over to MoWR. But local militias forced site engineers to operate the pumps with low voltage by over-riding the electrical safety switches. Four of the five brand new pump engines had electrical failures in October 2007. At evaluation time one pump was functioning and drinking water quantity and quality in the area had deteriorated since project start. The station was reportedly fixed in May 2009, after the evaluation field work.
Al Sejilah	Karbala'a	Supply only	SPP	588,217	11,250	8,000	3	2.5	1.25	Pumps and accessories delivered on site in 2007, but not yet installed by the MoWR; some pipes fitting missing. The Ministry procured them and installation is expected to be complete by end of 2009.
Kirkuk*	Tameem	Supply only (spare parts)°	Various	1,180,511	9,000	8,000	11 (3+8)	23.5 (6+17.5)	2.5	Successfully completed. Two of the three pumping stations restored to near full capacity. Improvement in quantity and quality of drinking water provided to about 1 million people in Kirkuk town and immediate vicinity. Cultivated area said to have doubled from 5,000 ha (20,000 donums) to 10,000 ha (40,000 donums).
North Suweira	Wasit	Supply only	Andritz	2,360,431	12,500	10,000	4	9	3	Command area of nearly 8,000 ha (31,377 donums) owned mostly by 3 large companies involved in aquaculture, animal production and raising poultry. Two pumps installed and two still pending. The pump station is still run by the old pumps but at low capacity.

†: Only procurement and installation cost. Other costs such as engineering, monitoring, supervision, administration and warranty period not included.
+: Cost for Huttaman, Al-Husseiniah and Salman Pak estimated based on overall KSB contract cost, apportioned according to pumps number and size in each station.
*: The pumping stations in Kirkuk include Al Qadisyah, Al FAO and Al Shaima. Al Shaima was used to irrigate gardens and parks in Kirkuk town and is still out of operation as it was not perceived to be a priority.
°: Project delivered spare parts rather than pumps in Kirkuk (bearings, autotransformers, grease pumps, oil pressure devices, capacitors, dewatering pumps, vacuum contactors NiCd bateries, bushes and sleaves).

New pumps manufactured and installed satisfactorily only in one site, Hutaman. The pumping station there was restored to full capacity. The pumps installed in September 2008 are presently operating 15 hours a day.

Two of the three pumping stations in Kirkuk could be restored to near full capacity thanks to the spare parts donated by the project. The pumping stations in Kirkuk include Al Qadisyah, Al FAO and Al Shaima. At present Al Qadisyah has 14 vertical pumps and Al FAO 8 pumps in operating conditions. Al Shaima was used to irrigate gardens and parks in Kirkuk town and is still out of operation as it was not perceived to be a priority.

Rehabilitation of the other six pumping station had not been completed at evaluation time due to various reasons, with poor security and lack of follow-up action by MoWR being primary factors in almost all cases.

In Mandeli, located in a very tense area closed to the border with Iran, replacement pumps and other mechanical and electrical equipments were delivered to the site, installed, commissioned and handed over to MoWR in a fully functional condition in 2007, all under the supervision of the pump contractor (Sigmainvest) which also provided factory training to two MoWR engineers. However, the survey conducted as part of this evaluation showed that only one of the five replaced pumps was currently functioning. The pumps were reportedly working only a few hours a day after commissioning because of low voltage on the electrical grid. Available electrical generators (provided by FAO precisely to offset electrical supply problems) could not be operated most of the time due to the lack of fuel at the site. Since the pumping station provides drinking water for the town of Mandeli, discontent with on-and-off operation of the pump was brewing. Local militias took it upon themselves to force the site engineer to operate the pumps continuously with low voltage by over riding the electrical safety switches. This resulted in four of the five brand new pump engines having electrical failures in October 2007.

FAO organized an inspection team to examine the exact cause of the failures and the report stated low voltage as the main contributing factor. MoWR refused to effect the repairs and demanded that the supplier carry them out. FAO organized a quotation (USD62,000) from the supplier for the repairs and offered to use project funds to repair the pumps – MoWR refused the use of project funds for this purpose. MoWR requested another inspection with their representatives present and FAO organized it – but with the same result (all this in a very insecure area). After the closure of the project, MoWR agreed to the use of project funds for the repairs, but no funding was left. FAO then requested MoWR to consider the use of their own budget to effect the repairs but they refused. Moreover, spare parts for 5 years have been supplied but were not delivered by the Ministry to the station, allegedly due to poor security.

In the North Suwira Pumping Station, the command area of nearly 8,000 ha (31,377 donums) is owned mostly by 3 large companies involved in aquaculture, animal production and raising poultry, and by the government. This is the most important animal, poultry and fish production area in the country and contributes significantly to the national economy. The command area under the project lost productivity due to shortage of water. Drinking water was also in short supply due to same reason. As this was a “supply only” station, MoWR were to install the 4 vertical pumps and matching

control panels provided by FAO. Two pumps were installed and two are still pending until the electrical and commissioning is complete on the first two pumps. Three engineers have been trained in Austria on installation, operation and maintenance of the pumping plants.

In Al Amiriyah (a "supply only" pumping station), the old pumps were not functioning due to faulty gear, control panels and other accessories. The replacement pumps were procured and delivered but initially could not be installed due to very poor security. The responsibility for installing the pumps (that were stored in Baghdad) is with MoWR who have begun the installation at the beginning of 2009 with their own staff.

The equipment for Salman Pak (also "supply only") is still stored in a MoWR compound in Al Sholeh. Installation had not yet started at evaluation time because of the lack of improvement in the security situation. Two old pumps are still working but only for 6 hours a day.

In South Al Huseiniah, the 3 pumps procured and installed by FAO could not be operated do to faulty electric motors bearings producing much vibration. As a result, expected benefits from the project have not been derived yet. The motors have been taken to Baghdad for repairs and the necessary spare parts provided free of cost by the supplier (KSP) in March 2009. The motors are being repaired with new bearings and will be installed shortly.

In Al Sejilah ("supply only"), the non-functioning pumps were initially replaced by 6 temporary pumps of Chinese origin procured under the MoWR budget with a rather small capacity ($1m^3/s$), as a temporary measure to keep the water level down as far as possible till the permanent pumps were installed. Good quality pumps of British origin with electrical control boards, vacuum system, electrical cable and other accessories were delivered to the site in 2007, but the pumps have not yet been installed by the MoWR. Reason cited for this has been a delay in obtaining some pipes fitting and accessories. A financial proposal has been sent to the Ministry which procured the pipes and fitting. Installation is reportedly ongoing and is expected to be complete by end of 2009. The procured pumps have been lying idle for more than two years.

The lack of follow-up by the Ministry in some of these pumps is primarily due to the prevailing security situation. According to news report, security has markedly improved in 2008, particularly in Sunni areas which used to be the most unstable and where many of the supply-only pumping stations are located. Some of the persons contacted by the evaluation mission stressed the importance of political factors, inasmuch as the MoWR is currently dominated by Shia personnel who might not feel in a particular hurry to install pumps in Sunni areas. This assertion could not be verified. Contacted by the evaluation mission about the lack of follow-up, the MoWR did not reply to emails or telephone calls. It also refused to meet with the Iraqi surveyors contracted for this evaluation.

It should be stressed that the pumps are designed for particular pumping stations, and would not work properly if installed elsewhere.

OSRO/IRQ/404/UDG

This project was the most successful of the three evaluated projects. Most components were successfully completed, resulting in very significant benefits.

Detailed situation map, pre-feasibility and feasibility studies and technical dossiers were completed for the four project sites selected with the MoWR (Heran and Kalar in Northern Iraq, Al Mussaib and Al Thraina in Central and Southern Iraq). Two of these had to be dropped: Kalar because the topographic survey submitted by the MoWR in Erbil was incomplete while security and a limited budget did not allow a new detailed topographic survey, and Al Thraina due to a request by the MoWR to replace the project by the urgent procurement of grouting machines for the Mosul Dam.

This project therefore undertook three main works: the rehabilitation of the small Heran gravity irrigation scheme in Northern Iraq (head works and canal lining); the rehabilitation of the Al Mussaib irrigation scheme in Central Iraq (a most ambitious project including the design and construction of a brand new pumping station, procurement and installation of pumps, the rehabilitation of a major drain called Drain 22 as well as canal lining and rehabilitation of feeder roads in the scheme); and the supply of grouting equipments for the large Mosul Dam to safeguard the stability of the dam.

The rehabilitation of the Heran gravity irrigation scheme was a small project implemented from June 2005 to January 2006 at the very modest cost of US$ 216,546. Two basins were dug to improve spring water collection and 3.88 km of canals were lined to reduce water losses. Roads and bridges were also built to improve connectivity. These interventions were successful and helped restore the command area to the original 145 ha.

The rehabilitation of Mussaib Irrigation Scheme was the most important piece of work. It started at the beginning of June 2006. FAO designed a new pumping station and built it through an Iraqi contractor (Al-Hadi Engineering). A number of problems occurred and resulted in important delays, such as the main intake collapsing once. Interviewed MoWR personnel on site explained that the company contracted by FAO hired a number of sub-contractors and that it was difficult to maintain the required quality of work with proper specifications. Pumps were purchased from Sigmainvest and installed in 2007. The work was successfully completed in early 2008, and included the rehabilitation of a major drain (Drain 22) as well as canal lining and feeder roads.

The supply of grouting equipments for the Mosul Dam was a rather simple yet effective work. The dam foundations require continual grouting to maintain stability. A purchase order for 6 drilling rigs (4 diesel and 2 electrically operated), spare parts and materials was placed in September 2006 and the rigs were delivered to site May/June 2007. The use of this equipment has successfully prevented seepage under the dam. More grouting equipment was reportedly procured by the Government and other donors since then.

Additional project achievements include:

- Three aquatic weed harvesters (1 of 10 m3 and 2 of 20 m3), 2 collection barges, 2 shore conveyor, 3 transport trailer and spare parts were procured from Aquarius Systems and delivered in October 2006 (US$1,503,956), to strengthen the weed control capabilities of the MoWR in rivers, canals and reservoirs. The specifications of the weed harvesting equipment being procured were changed twice by the MoWR, necessitating re-tendering.
- Surveying instruments including ten survey stations, computers and plotters were procured and delivered, to help in the mapping and database entry of all MoWR-operated pumping stations undertaken under project 403.
- Seeds and fertilizers in value of US $ 5.3 million were procured and distributed in early 2005 as an emergency measure.

Capacity Building Programme

An extensive human resource capacity development programme was drawn up in January 2005. This was partially approved by the MoWR on 20 February 2005 with a request for cost reduction. The MoWR also refused to submit the names of the participants in the first study tour to Egypt, which had to be cancelled. In fact, the MoWR has then requested FAO to substantially modify the training program previously agreed on. Although the original training program developed by FAO significantly focused on improving training capacities of the MoWR itself and strengthening linkages if the national institutions, the MoWR insisted that training program should focused on the irrigation experts currently employed by the ministry. The new reduced training program was finalised by FAO and approved by MoWR in June 2005.

A total of 40 Iraqi engineers have attended and successfully completed 6 to 8 weeks training programmes in the United Kingdom, the Netherlands and Italy. Four courses were arranged at four different institutions. One of these was funded under OSRO/IRQ/402/UDG and the other three were funded under OSRO/IRQ/404/UDG:

- Cranfield University, UK: Ten Iraqi engineers attended this 7 weeks course on "Managing, operating and maintaining irrigation and drainage systems" from 17 October to 9 December 2005
- Alterra-ILRI in Wageningen, the Netherlands: Ten Iraqi engineers attended this 6 week course in "Soil, Drainage and Land Reclamation" from 9 January to 17 February 2006.
- UNESCO, the Netherlands: Ten Iraqi engineers attended this six week course in "Agro-Hydrology" from 6 March 2006 to 15 April 2006.
- Bari, Italy: Ten Iraqi engineers attended this eight week course in "Planning and Design of Modern Irrigation Systems" at CIHEAM from 06 March 2006 to the 30 April 2006.

Three Iraqi engineers have been trained in the USA by the manufacturer in the maintenance and use of the weed harvesters in late June-early July 2006.

Finally, the two following activities of project 402 were dropped from the project, officially in consideration of the poor security situation:

- Water User Associations created and trained to contribute to the improved operation, maintenance and management of their fields irrigation and drainage networks, in collaboration with the technical institutions
- Training to farmers in cropping technology

6. Actual and Potential Results

Overall, the evaluation indicated that out of the 3 projects only one (OSRO/IRQ/404/UDG) was successfully implemented with most project objectives achieved. In projects OSRO/IRQ/402/UDG and OSRO/IRQ/403/UDG, project objectives were only partially achieved. A more detailed account of projects results follows, starting with the physical realisations of the concerned projects, and following with an analysis of results achieved under the training programme.

6.1 OSRO/IRQ/402/UDG

As explained above, the enlargement and cleaning of the main drain in Hilla-Hashemiya was only partly achieved. The situation at evaluation time was that the drain was slowly refilling, given that the Al Shomally pumping station had not been repaired. According to survey result, only 200 families would be residing and cultivating the scheme. It was unclear whether this referred to landowners or sharecroppers. It could be that the scheme is depopulated, or that many more sharecropping families exploit the scheme.

Feedback from residing households indicate that the excavation work resulted in moderate loss of arable land and the cutting of trees along the drain[21] but also reduced water logging in the immediate vicinity of the drain. Even this limited improvement is likely to be short-lived as the drain is filling up again and the drainage problem will therefore return. The MoWR took responsibility for the remaining works but no progress has been made so far and there does not seem to be any plan as to when the work will start again. If the Al Shomally pumping station is not repaired and the remaining part of the canal is not cleaned immediately, the benefit that derived from the 36.5 km of cleaning may soon be negated.

- **Recommendation 2:** Any further work on the Hilla-Hashemia scheme is dependant on the rehabilitation of the Al Shomally pumping station, for which adequate funding should be secured from the Government budget and/or from donors.

6.2 OSRO/IRQ/403/UDG

The works at the pumping stations in Kirkuk and Hutaman were satisfactorily completed and illustrate the types of benefits that can be expected of such interventions. Farmers interviewed around these pumping stations significantly

[21] The drain was widened and a road constructed along it for machinery operation.

benefited from the project in terms of availability of more irrigation water, reduction in water logging and salinity and increase in command area.

In Kirkuk, the two pumping stations of Al Qadisyah and Al FAO[22] benefited from the supply of key spare parts. As a result, the cultivated area doubled from 5,000 ha (20,000 donums) to 10,000 ha (40,000 donums). Cropping intensity and crop yield also increased resulting in improved food security, increased income and on farm employment. Irrigation water was generally equitably distributed among the farmers. Farmers also did not have much problem with the production and marketing of their produce, probably because of the proximity of the Kirkuk town. Most importantly, there was also an improvement in both quantity and quality of drinking water which is being provided to about 1 million people in Kirkuk town and the immediate vicinity.

In Hutaman, the pumps are presently operating for 15 hours a day, which has significantly reduced water logging and salinity. Interviewed farmers were highly satisfied with the benefits derived from the project. They indicated that that more water was now available for irrigation and confirmed that water logging and salinity have been reduced. They further indicated that before the project they hardly cultivated any land due to non-availability of irrigation water, but now they are cultivating 3,200 ha (12,800 donums) out of the 3,875 ha (15,500 donums) command area. However, they also indicated that some areas could not planted because farmers are not able to buy seeds and other inputs due to high prices, and that canals are still not being properly maintained. For further improving the performance of the project, the pumping house staff made a number of recommendations, interesting to assess the present operating conditions in the pumping station:

- 3 control gates should be installed in the main drainage to protect the pumps from high water levels. The basin should also be de-silted.
- The Bushan pumping station should be rehabilitated to reduce load the Hutaman pumping station.
- A dedicated electrical supply line should be constructed for the pump station. The present line runs through many villages before reaching the pump station which created power supply (voltage) problems.[23]
- Rehabilitate / replace old generator.
- Provide adequate spare parts for the pumps as those supplied under the FAO assisted project have al ready exhausted.

Rehabilitation of the other six pumping station funded out of project OSRO/IRQ/403/UDG has not been completed due to various reasons explained in previous sections of this report. In the four "supply only" pumping stations (Al Amiriyah, Salman Pak, Al Sejilah, North Suwira), local personnel were eagerly waiting for installation of the procured equipment at evaluation time. It should be recognized that huge investments have been made in procurement of these pumps and other accessories, and that this investment lay idle for quite some time until the security situation allowed the installation of the equipment.

[22] Another pumping station in Kirkuk, Al Shaima, was used to irrigate gardens and parks in Kirkuk town and is still out of operation as it was not perceived as a priority by local and national authorities.
[23] The same problem than in Mandeli.

The unfortunate lack of follow-up by the Ministry could be due to the prevailing security situation in predominantly Sunni areas, although one must stress that according to news report the security in Sunni areas has markedly improved in 2008. Some of the persons contacted by the evaluation mission pointed out at political factors, inasmuch as the MoWR is currently dominated by Shia personnel who might not feel in a particular hurry to install pumps in Sunni areas. This could not be verified. Contacted by the evaluation mission about the lack of follow-up, the MoWR did not provide explanations. It should be stressed that the pumps are designed for particular pumping stations, and would not work properly if installed elsewhere.

In Al Huseiniah, pumps were procured and installed but could not be operated do to faulty electric motors bearings producing much vibration. This was a design flaw. The motors are being repaired with new bearings and will be installed shortly. Expected benefits from the project are not derived yet.

In Mandeli, the pumping station was successfully rehabilitated and handed over to MoWR, but the pumps were reportedly working only a few hours a day after commissioning because of low voltage on the electrical grid. Available electrical generators (provided by FAO precisely to offset electrical supply problems) could not be operated most of the time due to the lack of fuel at the site. Since the pumping station provides drinking water for the town of Mandeli, discontent with on-and-off operation of the pump was brewing. Local militias took it upon themselves to force the site engineer to operate the pumps continuously with low voltage by over-riding the electrical safety switches. This resulted in four of the five brand new pump engines having electrical failures in October 2007.

While the MoWR and site engineers insisted that the station was still under warranty and stressed the supplier's responsibility, FAO and the supplier insist on the fact that the station was not operated under normal conditions. Whatever may be the case the end result is that the pump station is not functioning. The farmers and station staff termed the project a total failure and opined that water availability, water logging, salinity, crop yields, and drinking water quantity and quality have deteriorated since the project[24]. This adversely affected supply to Mandali-2 pumping station which in turn supplied Maudili-3 pumping station.

FAO and the MoWR reportedly repaired the station to full working conditions in May 2009, after the evaluation field work.

- **Recommendation 3:** The MoWR and Iraqi contractors – as appropriate – should fulfil their commitments and install all remaining equipment to the pumping stations for which the equipment was designed as soon as possible.
- **Recommendation 4:** FAO should not entertain future requests regarding pumping stations until the severe operating constraints such as low voltage in the electrical grid and lack of fuel for generators are solved by the Iraqi Government, as experience proves that expensive equipment can fall idle or become permanently damaged if operated under such conditions.

[24] Before the project was implemented, 3 pumps were operating for 2-3 hrs a day.

6.3 OSRO/IRQ/404/UDG

This project was the most successful of the three evaluated projects. Most components were successfully completed, resulting in very significant benefits.

The rehabilitation of the Heran scheme helped restore the command area to the original 145 ha. According to the survey commissioned by the evaluation, some of the farmers who had left the area due to the deterioration of the scheme returned to farming it. Farmers are consulted about the operation and maintenance of the system. A strong and functional WUA contributed to the equitable management of the system with distribution of water through out the scheme irrespective of location of the agricultural lands in the head, middle or tail areas. The project also increased productivity and farmers income. There, however, still exist some weaknesses in the system, which includes the deterioration of drinking water quality at one of the constructed spring retention basin.

In Al Mussaib irrigation scheme, interviewed farmers expressed strong satisfaction with the results of the scheme complete rehabilitation (pumps, pumping station, drain, canals and roads) and explained that, although the project was just finished, agriculture was flourishing again in Al Mussaib for the first season in years. The area under cultivation has increased by 20 to 30 percent. Before the project, the water level used to be high in the command area because water was draining very slowly due to damage in some parts of the drain embankment, vigorous growth of aquatic weeds in the canals and large-scale silt deposition in the drainage canals. All the components were successfully completed and as a result the availability of irrigation water has increased and water logging has been substantially reduced. This will likely result in enhanced agricultural production and incomes. However, the survey indicated that significant ad-hoc extensions of the scheme may result in some farmers taking more water than their share, thus depriving other farmers to their legitimate right to water. According to the site MoWR staff, the ad hoc extensions would representing 20,000 donum i.e. 5,000 ha, larger than the nominal size for the scheme of 12,000 donum i.e. 3,000 ha. This is the type of problems that would typically be solved through a well-functioning WUA, but this component of the project was unfortunately cancelled.

Another most successful component of the project was the supply of grouting equipments for the Mosul Dam. The drilling rigs procured in timely fashion by the project are working properly and the engineers at the dam site are very happy with their performance. The surveyors who visited the site also saw the equipment in operation. This equipment helped the dam managers restart the grouting programme so as to prevent seepage under the dam and ensure the continued stability of the structure. A break of the dam would result in hundreds of thousands of casualties in Mosul town and further south, and flooding of farm and urban land as far as Baghdad.

However, site engineer pointed out that the contract also included provision of practical training for operating the rigs but that no such training was provided. CDs were provided instead for installing and operation of the machines. The spare parts provided with the machine have been exhausted and they need to be procured on a priority basis.

It should be recognized that this is only a temporary measure. However, attempts by other donors to implement a permanent solution have so far failed. More grouting equipment was reportedly procured by the Government and other donors since then.

Additional project achievements include:

- The three aquatic weed harvesters and surveying instruments are reportedly being effectively utilized by the MoWR. They were used at the Al Mussaib scheme to remove weeds from the drainage canals and ease drainage congestion.
- Seeds and fertilizers in value of US $ 5.3 million were procured and distributed in early 2005 as an emergency measure. This was a "one shot assignment". During the field survey it was sometime that many farmers were unable to cultivate their land due high prices of inputs like seeds, fertilizers etc. Clearly the farmers were hoping for a return to pre-war subventions of these inputs. It is unclear whether such a move would be warranted. However, the support to a dependable market of agricultural inputs might form an interesting area of work for FAO in the future.

➢ **Recommendation 5:** FAO should commission a study on the structures and actors involved in the agricultural inputs market in Iraq, their coverage, quality, prices and strengths/weaknesses, to ascertain whether and how the development of the market could be supported in future programmes to provide sustainable, dependable and reasonably priced services to Iraqi farmers.

6.4 Capacity Building Programme

Capacity development was a rather successful component of the projects (402 and 404) as most of the training programs were successfully completed. A total of 40 Iraqi engineers have attended and successfully completed 6 to 8 weeks training programmes in the United Kingdom, the Netherlands and Italy. There was only one complaint that the technicians were not properly trained (Kirkuk pumping station). It should also be stressed that, although the pump technicians were trained in the operation and maintenance of the pumps, since many of these pumps are not in operation yet the technicians' skill may progressively erode as long as the pumps are not energized.

Unfortunately, the component dealing with water user associations and the training of farmers were dropped from the Al Maussaib and Hilla-Hashemia projects[25]. This is probably due to some institutional resistance within the MoWR. Besides, the legislative framework in Southern and Central Iraq does not allow the formation of water users association, contrary to Kurdistan, where appropriate legislation is reportedly in place. This is regrettable since under the prevailing security situation in Iraq, such institutions could play an important role in improving the management of

[25] However, a WUA training was reportedly implemented later under another irrigation project.

the schemes. An important success factor of the Heran project was perhaps the Water User Association (WUA) which was actively involved in the project management.

- **Recommendation 6:** Appropriate legislation should be prepared and voted into force, so that WUA can be formed in every scheme in Southern and Central Iraq.
- **Recommendation 7:** All future projects should have a strong component on training on improved water management and crop production techniques.

7. Sustainability

The principal challenge after the rehabilitation of the pumping stations and irrigation schemes will be their sustainability. From the evaluation results, this is an area for concern. The lack of predictable power supply and of a well-oiled system for pump monitoring and maintenance augur poorly for the sustainability of the rehabilitated pumping stations.

In fact most of the pumping stations and schemes supported could not be completed during the projects period and depend on the MoWR for finalisation and installation. FAO therefore, should not only put pressure on the MoWR to complete the projects but also help make adequate provision for sustainable operation and maintenance of the projects. FAO should help MOWR with any support it needs especially regarding the "software" areas (maintenance training, support to WUAs).

8. Cost-Effectiveness

The cost-effectiveness of the evaluated projects depends evidently on their degree of success as well as on their cost. Overall, it appeared to be quite low at evaluation time since many of the schemes and stations supported could not yet be successfully rehabilitated. This is no isolated case: post-war Iraq is full of expensive rehabilitation projects many of which have failed to reach an impact. This is due to the very challenging security situation in the country but also perhaps to excessive optimism immediately after the end of combat operations about how much rehabilitation aid the country could absorb.

Taking into consideration procurement and operating costs, the cost-effectiveness of the large pumping stations and irrigation schemes rehabilitation in Central and Southern Iraq would probably be quite low. The use of powerful and sophisticated pumping stations to irrigate and drain large Government-run schemes of the Center and South appears not cost-effective. One needs to pump water into the schemes and then pump it out of the schemes to limit water logging and salinity, thus requiring large investments and very significant operating expenses. These costs most likely far exceed the economic benefits under the current cropping system, largely dominated by low-profit cereals such as barley and wheat. It is high time to rethink the entire system with a view to making it more cost-effective.

In view of the current drought in Iraq, FAO initiated in 2009 a discussion on water management, stressing the needs to reduce the amount of water used in agriculture by increasing agricultural water productivity and water use efficiency. According to the FAO Water Development and Management Unit (NRLW), an increase of 10% of water efficiency in the Iraqi agricultural sector may free up enough water to serve the entire urban population of Iraq, and an increase of 20% in water use efficiency in agriculture may free up enough water to serve the entire Iraqi industry.

- **Recommendation 8:** Security permitting, a technical and economic review of irrigated agriculture in Central and Southern Iraq appears in order to assess more precisely the economic viability of large Government-operated irrigation and drainage schemes, guide future rehabilitation priorities and investment policies, and identify options to improve cost-effectiveness, including improved water efficiency, increased involvement of WUAs in the management of the schemes, lower-cost investment options, and the possibilities to plant higher-value crops.

Table 8: Procurement and rehabilitation costs per hectare of rehabilitated schemes

Project	Location	Governorate	Procurement and rehab. cost	Command area (ha)		Number of beneficiaries (households)		Cost per irrigated ha †	
				as per project reports	as per survey*	as per project reports	as per survey*	as per project reports	as per survey*
402	Hilla-Hashemia	Babel	2,558,446	62,500	62,500	50,000#	200	41	41
403	Al Amiriyah	Anbar	1,688,159	11,250	?	2,000	?	150	?
403	Al Huseiniah	Babel	1,804,447	25,000	6,250	5,000	1,000	72	289
403	Salman Pak	Baghdad	3,994,219	45,750	?	10,000	?	87	?
403	Huttaman	Dhi-Qar	1,127,779	3,250	3,875	372	380	347	291
403	Mandeli 1	Diyala	3,815,836	12,500	2,500	5,000	39,000	305	1,526
403	Al Sejilah	Karbala'a	588,217	11,250	15,000	8,000	8,000	52	39
403	Kirkuk [1]	Tameem	1,180,511	9,000	11,000	8,000	2,000	131	107
403	North Suweira	Wasit	2,360,431	12,500	7,844	10,000	50,000	189	301
404	Al Musaieb	Babel	2,903,750	3,000	3,000	2,500	500	968	968
404	Heran	Erbil	216,000	145	145	180	180	1,490	1,490

Notes: * Data from MoWR site engineers collected during the survey commissioned by this evaluation.
Mosul omitted because the purpose of FAO's support is related to insuring the dam's stability, rather than irrigation per se.
As per feasibility study.
† Procurement and rehabilitation costs only, i.e. excluding operating costs.

Even if the construction cost per hectare is high in Heran because of the small size of the scheme, such small gravity irrigation schemes are probably much more cost-effective to run since they require no pumping and can be operated by Water User Associations. The evaluation therefore supports the current orientation of FAO towards doing more of these small gravity schemes in the North (120 schemes, mainly about head work and spring collectors).

A number of factors have weighted on cost-effectiveness:

- Priority setting within the MoWR was sometime a long and tedious process because of the fact that the Government was newly established. This affected the cost-effectiveness of the project in several ways: the projects financed numerous feasibility studies and tender documents for pumping stations which were not subsequently built, and the project staff spent an inordinate amount of time on preparing for various options later abandoned.
- Once again, poor security rose the cost of pretty much all operations inside Iraq, from surveying to transport, installation and supervision of equipment; some suppliers required war risk insurance; contractors either built these risks into their bid or requested amendments to cover them; poor security in some locations resulted in huge delays in installing the pumps; etc.

9. Conclusions and Recommendations

9.1 Conclusions

The evaluation demonstrated that, when successful such as in Hutaman, Kirkuk, Al Mussaib, Heran or Mosul, the projects provided much required drinking and irrigation water, reduced water losses, water logging and salinity and allowed farmers to expand the cultivated area. These notable achievements boosted the moral of both the Iraqi government and its people. However, in many locations, the projects interventions were not yet successfully completed at evaluation time, chiefly due to severe insecurity (e.g. Mandeli but also all the "supply only" pumping stations), pump design flaws (Al Huseiniah) and more fundamental project conception issues in Hilla-Hashemia, where the project put the cart of cleaning the main drain before the horse of rehabilitating the pumping station. It is hoped that in the future the security situation will improve, allowing for the successful completion of projects activities and for much easier and effective project implementation.

Although some of these projects were only partially completed, FAO deserves credit for the courage with which it undertook ambitious rehabilitation work under extremely trying conditions.

Project implementation and supervision by FAO staff and consultants was handicapped by the inability of the FAO staff and consultants to travel in South and Central Iraq. FAO partially compensated these constraints by establishing a Steering Committee meeting every two months with representatives from the MoWR and Iraqi contractors, and by hiring Iraqi engineers through third parties to supervise the projects sites, although their movement was also severely restricted. The supervision of the projects was therefore done by "remote control", not the ideal method but the only approach available under the circumstances.

Just as project implementation was constrained by poor security in the country, the evaluation could not be conducted in a classic and direct way. The team of international evaluators could unfortunately not travel inside Iraq and had to rely on independent Iraqi surveyors, emails, phone calls and interviews in Amman. A number

of issues could therefore not be studied in sufficient depth, such as impact and social equity in the distribution of benefits.

9.2 Recommendations

A limited number of recommendations were issued, principally geared towards completing project activities.

1. The network of piezometers should be installed without further delay and FAO should work out a plan with the MoWR to that effect. As most of the irrigation projects in the country suffer from the twin problems of water logging and salinity, such monitoring is extremely important for proper management of the water table and soil and water quality for agricultural production.
2. Any further work on the Hilla-Hashemia scheme is dependant on the rehabilitation of the Al Shomally pumping station, for which adequate funding should be secured from the Government budget and/or from donors.
3. The MoWR and Iraqi contractors – as appropriate – should fulfil their commitments and install all remaining equipment to the pumping stations for which the equipment was designed as soon as possible.
4. FAO should not entertain future requests regarding pumping stations until the severe operating constraints such as low voltage in the electrical grid and lack of fuel for generators are solved by the Iraqi Government, as experience proves that expensive equipment can fall idle or become permanently damaged if operated under such conditions.
5. FAO should commission a study on the structures and actors involved in the agricultural inputs market in Iraq, their coverage, quality, prices and strengths/weaknesses, to ascertain whether and how the development of the market could be supported in future programmes to provide sustainable, dependable and reasonably priced services to Iraqi farmers.
6. Appropriate legislation should be prepared and voted into force, so that WUA can be formed in every scheme in Southern and Central Iraq.
7. All future projects should have a strong component on training on improved water management and crop production techniques.
8. Security permitting, a technical and economic review of irrigated agriculture in Central and Southern Iraq appears in order to assess more precisely the economic viability of large Government-operated irrigation and drainage schemes, guide future rehabilitation priorities and investment policies, and identify options to improve cost-effectiveness, including improved water efficiency, increased involvement of WUAs in the management of the schemes, lower-cost investment options, and the possibilities to plant higher-value crops.

Terms of Reference for the
Evaluation of Five FAO Projects Implemented in Iraq

20 March 2008

A. Background

Towards the end of January 2008, TCES requested PBEE to investigate whether, how and at what cost could five FAO projects implemented in Iraq be evaluated during the year 2008. The projects are the following:

- OSRO/IRQ/402/UDG - Assessment and rehabilitation of community irrigation schemes and restoration of irrigation water supply in rural areas (US$5.1 ml)
- OSRO/IRQ/403/UDG - Improvement of water supply and drainage provisions through the rehabilitation of pumping stations (US$25.1 ml)
- OSRO/IRQ/404/UDG - Assessment, emergency maintenance and rehabilitation of the community irrigation schemes and restoration of water supply in rural areas (nearly US$17 ml)
- OSRO/IRQ/406/UDG - Restoration of veterinary services in Iraq (US$8.7 ml)
- OSRO/IRQ/407/UDG - Restoration and Development of Essential Livestock Services in Iraq (US$8.5 ml)

All these were funded out of the UNDG-managed Iraq Trust Fund (ITF) as part of the International Reconstruction Fund Facility for Iraq (IRFFI)[26], and were prepared and approved rather rapidly in 2004, leaving ample flexibility during implementation to adapt the project objectives and priorities to a rapidly changing environment.

The **first three projects above (402, 403, 404)** are dealing with the same issues of irrigation and drainage. Agricultural production in central/southern Iraq relies almost entirely upon irrigation. However, salinization and waterlogging have affected most of the irrigation schemes built over the years between the Tigris and Euphrates rivers. The shallow water table complicates the management of salinity by restricting the downward leaching of salts through the soil profile. The construction in the 1980's of the Main Outfall Drain (MOD) collecting drainage waters and channelling them to the Arab Gulf was in response to the overall drainage problem. However, due to the sanctions and conflict during the last decade many connections of primary drains to the MOD were not implemented. The lack of maintenance of drainage canals and the operating problems on many of the drainage pumping stations during the last decades (including lack of electrical power during large parts of the day, poor design, lack of maintenance, and looting during the latest conflict) have contributed to further worsening of the drainage problem. In affected areas, yields of wheat and barley crops have decreased substantially. Important areas are not cultivated, affecting severely farmers' revenues and income generation. The Iraqi Ministry of Water Resources (MoWR), following

[26] The IRFFI was launched early in 2004 by the United Nations and the World Bank to help donor nations channel their resources and coordinate their support for reconstruction and development in Iraq. The Facility has two trust funds for donor contributions, each with its own characteristics and procedures: the World Bank Iraq Trust Fund, administered by the World Bank Group and the United Nations Development Group (UNDG) Iraq Trust Fund (ITF), administered by UNDP on behalf of Participating United Nations Organizations. As of 30 November 2007, deposits in the UNDP ITF amounted to US$1.274 billion, most of it from the EU and Japan.

its restructuring after the last war, has placed high priority in reclaiming irrigated agricultural lands from perennial flooding and salinity due to poor drainage.

The **fourth and fifth projects above (406 and 407)** deal with the restoration of veterinary and animal production support services, which were much affected by looting in 2003. This situation increases the risk of occurrence and spread of contagious and infectious diseases, which could have detrimental effects on livestock-based livelihoods and on the supply of protein-rich food (milk, cheese, yoghurt, meat, eggs) to the population, thus endangering food security as well as food safety. The collapse of the livestock extension services and governmental breeding and artificial insemination programmes was reported to have serious consequences on the livelihood of Iraqi pastoralists and livestock or poultry farmers.

A summary of these projects as designed is provided in Annex 1.

The status of implementation of the projects can be summarized as follows:

OSRO/IRQ/402/UDG - Assessment and rehabilitation of community irrigation schemes and restoration of irrigation water supply in rural areas:

- Initially the project was located at Ramadi, for which FAO undertook a feasibility study and tender. This was subsequently changed to Hilla-Hashimiya at the request of the MoWR, resulting in substantial delay.
- A contract for excavation work on the main drain of the Hilla-Hashemiya system was awarded to an Iraqi company. By mid-2007, the total excavated materials amounted approximately to 1.7 ml m^3 which represent 85% of the total contract quantity. However, FAO ended the contract as the Al Shomally pumping station dewatering the drain broke down and was not being repaired by the MoWR. The contractor could not continue the excavation works and was charging the Organization hiring costs of the equipment. The contracted quantity of excavation is sufficient to drain out more than 90% of the irrigation schemes surrounding the Hilla Hashimiayh drain but would in any case be insufficient to complete the rehabilitation of the drain due to higher than expected levels of siltation.
- The component dealing with water user associations and the training of farmers were dropped considering the poor security of the area. These activities were also deemed less critical in the Hilla-Hashimia project than they were in originally-planned Ramadi.
- The following equipment was procured: one excavator, two tipper trucks, one fuel tanker, two water tankers.
- One training course on "Operation and Maintenance of Irrigation and Drainage Schemes" was held for 10 MoWR engineers at Cranfield University, England.
- No progress has been achieved yet on the installation of piezometers for monitoring the water table and salinity.

OSRO/IRQ/403/UDG - Improvement of water supply and drainage provisions through the rehabilitation of pumping stations:

- The project was originally intended to rehabilitate 125 priority pumping stations, a figure not based on precise assessments of each pumping stations. A complete and detailed status report for the first 12 priority pumping stations to be rehabilitated was later produced, and a risk management study completed in 2004 indicated that for all

these, equipment to be replaced would have to be manufactured specifically, as original models were not in production anymore. This led to significant unit cost escalation. As a result it was subsequently agreed to rehabilitate only 12 stations, later reduced to 8, with work one additional station being conditional on further funding.

- The status of work is as follows:
  - Kirkuk pumping station: spare parts in value of US $ 1,180,511 have been procured and delivered.
  - Mandali 1 pumping station: Replacement of pumps in value of US $ 3,815,836 have been delivered to site, installed and handed over to the MoWR .
  - Al Sijilla, North Suwira and Al-Amiriyah: the pumps and other equipment have been delivered in 2007. MoWR have agreed to undertake their installation, in 2008.
  - Salman Pak, Al Hussainyah and Hutaman: equipment was manufactured and delivered in 2007. While for Salman Pak installation of the delivered equipment will be performed by MoWR due to security situation, installation of the other two stations will be completed in 2008 by FAO.
  - Al Shomally: survey report and tender for services completed. Rehabilitation of this station is subject to further funding.
- Formal training programme successfully completed.
- A pumping station database was designed and is being filled, covering all 305 pumping stations under the MoWR.

<u>OSRO/IRQ/404/UDG - Assessment, emergency maintenance and rehabilitation of the community irrigation schemes and restoration of water supply in rural areas:</u>

- The rehabilitation of the Hiran scheme (145 ha; 180 farming families) was completed early in 2006.
- The equipment for Mussaib pumping station (Drain 22) will be installed on site in early 2008. The rehabilitation of Mussaib Irrigation Scheme (3,000 ha; 2,500 farming families) is well under way and by mid 2007 95% of drain cleaning, 80% of the irrigation canal lining, 80 % of the road and 80% of the culverts had been completed.
- The originally planned work on Al-Thraima scheme was replaced under MoWR request by the supply of grouting equipment for urgent rehabilitation works at the large Mosul Dam, where foundations require continual grouting to maintain the dam's stability. The current machinery is old and unreliable and cannot keep pace with erosion under the dam. A purchase order for drilling rigs, spare parts and materials was placed in September 2006 and the rigs were delivered to site May/June 2007. MoWR will complete works using their own resources.
- Seeds and fertilizers in value of US $ 5.3 million were procured and distributed.
- The Kalar Irrigation Project rehabilitation remains indefinitely postponed, following a weak technical dossier for which both MoWR and AGLW requested major changes requiring detailed field studies, which were not practical under the deteriorating security situation. There were also inadequate funds in the budget to take implementation any further.
- Three aquatic weed harvesters and complete surveying instrumentation including ten survey stations, computers and plotters have been procured. Three Iraqi engineers have been trained by the manufacturer in the maintenance and use of the recently delivered harvesters.

- A total of 30 Iraqi engineers have attended and successfully completed 6 to 8 weeks training programmes in the Netherlands and Italy.
- Training of Water Users Associations is being undertaken in March 2008

OSRO/IRQ/406/UDG - Restoration of veterinary services in Iraq:

- Project funds were released late, only partially and in several installments, making planning difficult and leading to slowdowns and even a freeze on project activities from mid 2006 until mid 2007. Due to this long freeze in combination with the late availability of the last tranche of funds, an extension of the project until July 2008 was required and approved.[27]
- Five training modules about change management were organized by FAO for Iraqi veterinary managers from the central Veterinary Services in Baghdad and from the border inspection posts.
- 25 veterinary publications covering many aspects of the veterinary science have been delivered.
- Equipment for Avian Influenza disease prevention, diagnosing and control has been delivered. FAO has facilitated and advised the MoA during the outbreak of HPAI in northern Iraq in 2006, and is currently (late February 2008) again doing so for a suspected new case in Basra.
- Review of disease control policies, and drafting of strategy papers. The HPAI preparedness plan as now prepared by the MoA will again be reviewed in May 2008. For Rinderpest, FAO is advising and assisting the MoA in its OIE application for a disease-free status.
- The foreseen construction of nine new veterinary clinics did not materialize. First, MoA requested to cancel the veterinary clinics since other funding sources were found for that, and to give priority to assistance to a national Brucellosis vaccination campaign. Then, due to the funding shortage at that time, procurement of the massive amount of vaccines had to be postponed, and was eventually replaced by support to control measures for the HPAI outbreak and for future HPAI prevention and preparedness measures.
- Almost 200 veterinarians from central, provincial and district level have been trained abroad (Jordan, USA, Australia, Morocco, Egypt, UK, Germany) on a wide range of veterinarian topics and disciplines.
- 2 Central and 18 Governorate veterinary laboratory hospitals have been equipped and are available for disease control and surveillance work.
- A national disease information system has been set up and equipped.
- A wide range of required goods was identified with and provided to the MoA Veterinary Department and the State Veterinary Company, such as seven cold stores, 15 refrigerated trucks, six pickup trucks, two forklifts, 100 motorcycles, a freeze dryer, seed strains for livestock vaccine production, reagents, veterinary field supplies, and veterinary laboratory supplies, chemicals and equipment.

OSRO/IRQ/407/UDG - Restoration and Development of Essential Livestock Services in Iraq:

- 30 Holstein Friesian bulls were imported from Australia and have started production of high quality semen, which is being distributed in liquid nitrogen for artificial

[27] Despite the project being approved with a budget of 10.5 million US$, only 8.7 million were eventually given to FAO.

insemination in the district veterinary centres nationwide. One of the two procured liquid nitrogen plant came into production in February 2007, and staff was trained on its installation and maintenance at the supplier's premises in the Netherlands. Due to the prevailing security situation in Abu Ghraib where the livestock centre is located, MoA has decided to install the second liquid nitrogen unit in Mosul or Basra. Training courses on artificial insemination were given in France and Morocco.

- 1000 Awassi sheep from Turkey and 200 Shami goats from Cyprus were procured and the construction of the required Livestock Breeding Center in Abu Graib, Baghdad, finished by the end of 2006. Both have produced already two generations of offspring for distribution, and part of the increasing breeding flock has also been transferred to the Mosul Breeding Centre.
- Similarly, the MoA changed the location of the Central Feed Analysis Laboratory from Abu Ghraib to the Baghdad city centre. Construction of the premises was completed in the second half of 2007. All the planned equipment has already been delivered and some final additional requested equipment was procured and will be delivered in the first half of 2008. A company was contracted for installation, training and maintenance. Staff has been trained on feed analysis techniques in the UK, the Netherlands and Egypt.
- Two training of trainer courses on extension, husbandry and small ruminant production took place in Syria and Morocco for a group of 20 Iraqi livestock extension specialists. This group of trained staff on its turn has delivered ten training courses for 95 field staff from all governorates extension centers and three courses for 36 farmers have been conducted. Various local symposiums in the field of animal production (calf fattening, artificial insemination, etc.) have been organized.
- A 3.5 week training course on bovine embryo transfer technologies and applications in genetic improvement was also delivered to three Iraqi veterinarian specialists in Wageningen University, the Netherlands. Necessary equipment to put this technology into practice has been provided to the Abu Graib livestock centre.
- In order to support the implementation of a national livestock survey (a top priority of the MoA/Livestock Department), a planning workshop was organized followed by a training course on survey techniques, interviewing, data collection, data analysis, etc. All required communication, GPS and computer equipment has been procured and delivered to the MoA which is planning to start the survey in 2008

B. Purpose of the Evaluation

The five projects have all been formulated together and will all come to an end at various points in 2008. They also deal with the same thematic area: rehabilitation of agriculture support services and infrastructure, and would hence benefit from being evaluated as a cluster.[28]

The evaluation is intended, as the projects draw to a close, to provide accountability to and issue recommendations for the Government, FAO and the donor on the further steps necessary to consolidate progress and ensure achievement of projects objectives. Any further need for external assistance should also be identified.

[28] It should be noted that a sixth project, OSRO/IRQ/702/UDG – Rehabilitation and Maintenance of Traditional Irrigation Schemes in Resettled Areas, could also be included in the current evaluation in order to review the work of FAO on smaller, farmer-managed irrigation schemes in addition to state-managed ones.

C. Scope of the Evaluation

The mission will assess the:

Project identification, design and planning issues:

a) Quality of project design; clarity, consistency and realism of the project's inputs, activities, outputs and objectives, including specification of targets, identification of beneficiaries, prospects for sustainability, realism and clarity of institutional and managerial setup, feasibility study and assessment of risks;

b) Appropriateness of subsequent changes in project locations or technical options;

c) Relevance and technical soundness of the projects as designed and later amended to the rehabilitation and development priorities of the Government of Iraq and the target population.[29]

Project management:

d) Efficiency and adequacy of project implementation modalities; in particular, assess how the project teams managed to ensure project monitoring and oversight in spite of having to operate from Amman, Jordan due to the adverse security situation in Iraq.

e) Availability and timeliness of funds from the donor and the Government (as applicable) and its consequences; extent of national support and commitment; quality of administrative and technical support by FAO;

f) Efficiency of implementation: quantity, quality, cost and timeliness of FAO and counterpart inputs and activities;

g) Effectiveness and use of monitoring and self-evaluation for project steering and adaptive management;

Project results and impact:

h) Project results, including a full and systematic assessment of outputs produced to date (quantity and quality as compared with workplan and progress towards achieving the immediate objectives).

i) Degree of utilisation of significant equipment procured under the projects, notably the installed pumping equipment, aquatic weed harvesters, the cattle semen production plant, laboratory equipment, etc.

j) Assessment of the number of counterpart staff trained, effectiveness and sustainability of human resource development activities for counterpart ministries, usefulness of such technical training, study tours and change management training courses.

[29] The evaluation should take into account the fact that the original project design was rushed in view of the launching of IRFFI and the immediate need for project proposals. This, as well as evolving requirements from the Iraqi authorities and a fast deteriorating security situation, necessitated significant modifications in project design. Therefore, more attention should be given to the relevance of the projects as amended than to the quality of the original design, recognised as rather weak.

k) Assessment of the number of beneficiaries[30] and of their degree of vulnerability; equity issues in the distribution of projects benefits, e.g. female-headed households vs. male-headed ones, small-holders vs. large land owners.

l) Impact of the projects, e.g.:

Livestock and veterinary projects:

- impact on the capacities and capabilities of veterinary and AI services, on production levels and rural livelihoods, and (to the extent possible) on the sanitary situation of livestock in the country and on food safety;

Irrigation schemes and pumping stations rehabilitation:

- impact on the area put under cultivation (including through ad hoc, farmer-built system extensions, which appear to be numerous), on production levels, on farmer's livelihoods and food security, and (to the extent possible) on water quality downstream (reduction of pollution of water for human and livestock consumption?);
- progress achieved towards the creation or capacity building of water users associations; participation of farmers in operation and maintenance of the rehabilitated irrigation systems; policy lessons in this regard;

General:

- impact on the capacities and capabilities of the various national implementing partners, in particular within Government.

m) To the extent possible, cost-effectiveness, project cost per beneficiary, economic profitability and sustainability of the projects, notably of the rehabilitated irrigated schemes. Are these costs reasonable and can the schemes be sustained economically, without the recourse to state or international assistance?

n) Prospects for sustaining projects' benefits after the termination of the project.

o) Prospects for the replication of the projects in other regions, if applicable;

Based on the above analysis the mission will draw specific conclusions and make proposals for any necessary further action by Government, FAO and/or the donor to ensure sustainable development in these areas, including any need for additional assistance in general and specifically with respect to activities of the individual projects prior to completion. The mission will draw attention to any lessons of general interest, e.g. on the relevance of similar rehabilitation projects in a country suffering from severe insecurity, or on how to manage and monitor projects in insecure countries.

D. Proposed Methodology

The methodology is premised on the fact that the international evaluators will most likely *not* be allowed to travel inside Iraq, except perhaps in the North of the country. Even national consultants will find their capacity to move within the country severely limited. This may

[30] The project documents were prepared by technicians with little attention devoted to social and economic dimensions. The number of beneficiaries is generally estimated based on technical ratios, e.g. seven persons or one family per hectare of land rehabilitated.

have implications on the type of information that can be collected, its quality and the time needed to collect information. Some flexibility in conducting the evaluation will have to be built on in the process.

The general approach proposed is therefore to combine an evaluation mission by international consultants (and/or FAO staff) to Amman, Jordan, with as many means of independent verification as possible. The following tools are recommended to this end:

- Preparatory work by the Amman Office would consist in informing the relevant Iraqi counterparts about the evaluation, as well as collating all necessary documentation and lists / contacts of beneficiaries.
- One or several[31] missions by international consultants (and/or FAO staff) to Amman, Jordan, in order to interview project staff, review project documentation, and meet with counterparts from the Government of Iraq who will have to be flown in. If a trip to northern Iraq is possible, a visit to the Erbil governorate would prove particularly useful to verify service provision in the field, e.g. veterinary services and the rehabilitation of the Hiran irrigation scheme.
- A survey of selected projects sites by independent teams would be the best way to ascertain progress and results. Three Iraqi teams would probably be needed, each operating in a broad region: north, centre, and south. These teams could visit rehabilitated irrigation schemes and interview farmers groups there. They could also try to interview beneficiaries of the veterinary and artificial insemination services as well as the recipient of the goats and sheep, at least if lists of beneficiaries can be made available for these projects and components.[32]
- These national surveyors, with the assistance of farmers, could photograph and sketch the visited rehabilitated irrigation schemes, indicating where are the main infrastructure that were rehabilitated, the farmer-constructed sub-schemes, the cultivated and non-cultivated land, and where are the low-lying, water-prone areas. These sketches will prove useful to interpret satellite images but also might constitute useful, quick-and-dirty documents in their own right to gauge impact.
- Satellite imagery of selected project sites where an impact can hopefully be evidenced from such images, i.e. for irrigation and drainage projects that have started delivering benefits by early 2008. The sites of Hiran, Hilla-Hashimia, Al Mussaib and Mandeli have tentatively been selected based on implementation progress, and a review of available images and costs is underway thanks to FAO/NRCE (see Annex 2). On the images accessed so far, free standing water and saline areas seem to be easily identified (Annex 3). The best period of year for taking the "before" and the "after" pictures would probably be spring, as it is the period of year with both the highest chances of flooding and the greatest vegetative growth.
- Email or telephone survey of Government staff having undergone training, so as to assess the quality of the training and the degree to which it was useful to the staff in question; the extent to which the current "brain-drain" in Iraq has affected capacity building efforts could also be assessed through telephone interviews.

[31] The international consultants will have to meet at various points in time (for preparation, discussion, triangulation and reporting) with their national surveyors/consultants.

[32] Tracking and interviewing a sufficient number of users of veterinary and AI services could prove a significant challenge, depending on the quality of book keeping in vet clinics and the AI centre. Another factor is transhumance: some of the clients could be quite mobile. The livestock element of the survey will be dropped if it proves unfeasible.

E. Human Resources for the Evaluation

The following consultants and staff resources are envisaged:

- Evaluation Team Leader: a specialist in evaluation of agriculture rehabilitation programmes, possibly a staff from PBEE or an independent consultant (50 days in Rome, Amman and possibly Erbil). Knowledge of Arabic would be an asset.
- Irrigation Specialist: an international consultant with experience in large-scale irrigation projects and equipment, tasked with the assessment of all the available data about projects 402, 403 and 404 and with the evaluation of their technical quality and likely impact (25 days, mostly in Amman and possibly Erbil).
- Livestock Specialist: an international consultant, possibly a veterinarian with experience in both animal health and artificial insemination programmes, tasked with the assessment of all the available data about projects 406 and 407 and with the evaluation of their technical quality and likely impact (25 days, mostly in Amman and possibly Erbil).
- Remote Sensing Specialist: an international consultant who would be hired by FAO/NRCE for the analysis of procured satellite images (tentatively set at 15 days pending NRCE estimate).
- National Survey Coordinator: an independent consultant of Iraqi nationality, he or she will be in charge of coordinating the field surveys, controlling data quality, and reporting on the survey and data entry process. He or she should be able and willing to travel to all parts of the country. If that is impractical for security reasons, one survey coordinator could be hired for the central regions around and south of Baghdad, while another coordinator deals with northern areas. This solution would be sub-optimal though as it could increase surveyor bias (60 days in total).
- Surveyors: an estimated 15 surveyors would be hired (20 days each). Ideally, all the surveyors should be trained in Amman by the Team Leader and the National Survey Coordinator. If visas cannot be obtained for 15 people, then only two or three supervisors could be trained in Amman. The teams should be equipped with digital cameras and with GPS handsets in order to ground-truth satellite images, e.g. identifying water-logged land in some irrigation schemes.

The Survey Coordinator and the Surveyors could of course be contracted through the same consulting company.

F. Timetable

	Feb. 08				March				April				Mai				June				July				August				Sept.				Oct.				Nov.				Dec. 08			
Activities	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
TORs preparation																																												
Decision to go ahead with evaluation																																												
Procurement of satellite images																																												
Analysis of satellite images																																												
Preparation of background doc. by FAO Amman																																												
Call for interest for consultancies / impact assessmt.																																												
Selection & contracting of evaluators / impact assessmt. teams																																												
Training for impact assessment (Jordan)																																												
Impact assessment surveys																																												
Impact assessment: analysis and report writing																																												
Evaluation team: consultations at FAO Headquarters																																												
Consultations in Amman / possible mission to Erbil																																												
Debriefing in Rome																																												
Drafting of Evaluation Report																																												
Comments on the draft																																												
Final report																																												

G. Reporting

The evaluation is primarily addressed to FAO (and notably TCES), to the Government of Iraq, and to the UNDG ITF Steering Committee.[33]

A draft version of the report will be prepared by the Team Leader and presented to FAO/TCES. Based on comments received from FAO colleagues, PBEE will then prepare a second draft for broader circulation to and discussion with the Government of Iraq and the ITF Steering Committee.

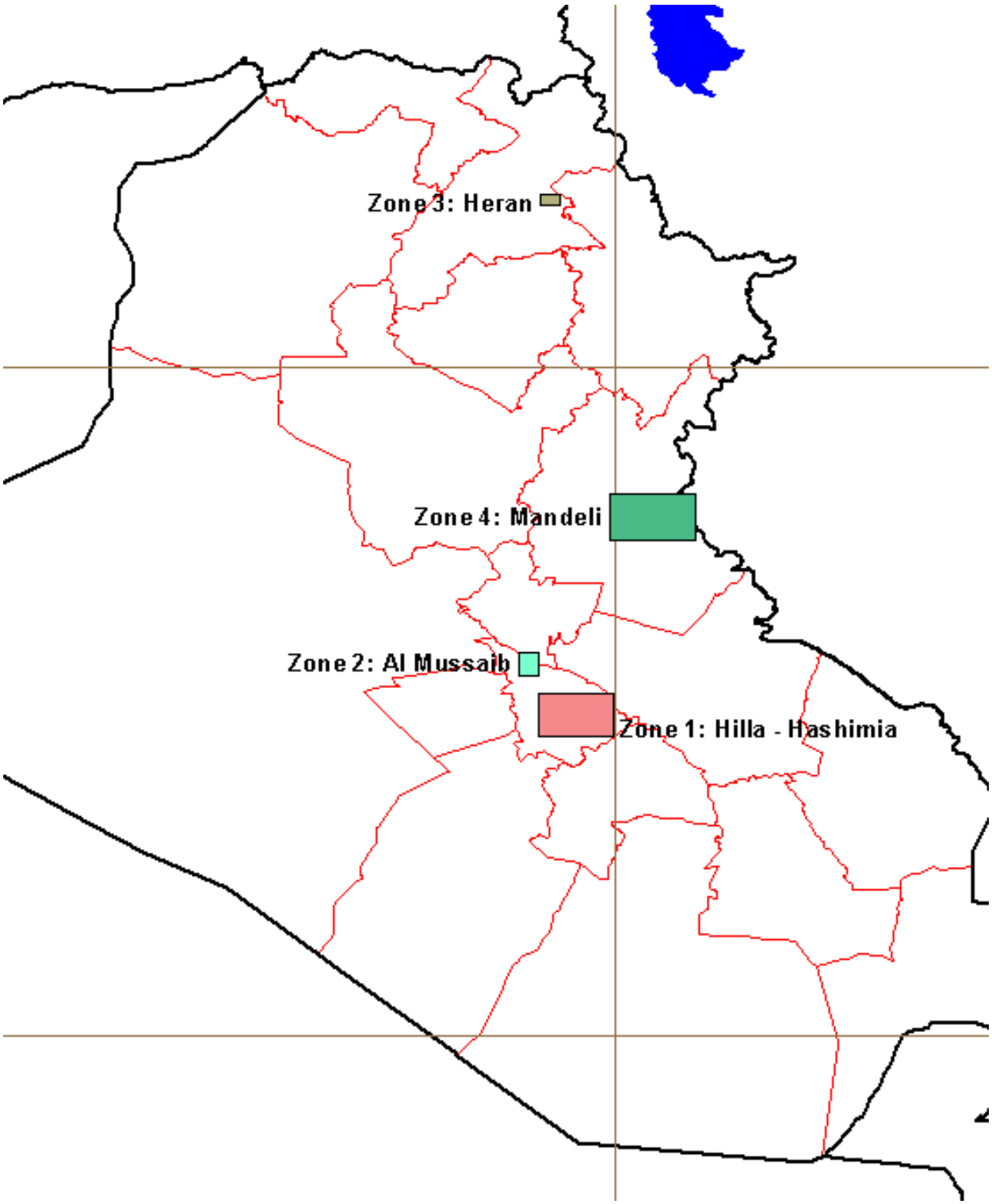
The procedures for the UNDG ITF request individual project reports. However, these five individual reports will use some common material especially on management issues (funding, planning, monitoring, etc.), since the peculiar form of management of FAO Iraqi projects reflects the security conditions in the country and hence applies equally to all projects.

[33] Important donors of the ITF could also be included in this group of primary stakeholders.

Annex 1: Projects Logical Frameworks

(to be added)

Annex 2: Areas envisaged for the satellite imagery analysis



Annex 3: Satellite image of a poorly drained irrigation scheme (Al Mussaib)

The dark area in the middle would be free standing water.

List of Reviewed Documents

1. Feasibility Reports of the projects, July 2005
2. Six Monthly Progress Reports of the projects
3. UNDG ITF Final Reports – One for each Project
4. Minutes of the Co-ordination Meetings.
5. Terms of Reference
6. Risk Management Study for Project OSRO/IRQ/403/UDG.2005
7. Survey Summaries of the Pump Station Assessments
8. Project Documents for the three projects, 2004
9. Draft Proposal for Project OSRO/IRQ/402/UDG, November-2004
10. Project Document Cover Sheets, 2004
11. Pre-feasibility Study of Projects OSRO/IRQ/404/UDG, February-2005
12. Forms for Submission to UNDG Iraq Trash Fund Steering Committee, May, 2004
13. Final Report and Assessment of Heran Irrigation Scheme.
14. Completion Report on Improvement of water supply and drainage provisions through the rehabilitation of pumping stations.

Abbreviations

CTA – Chief Technical Officer

FAO - Food & Agricultural Organization of the United Nations

ITF – Iraq Trust Fund

MOA – Ministry of Agriculture

MOD – Main Outfall Drain

MOWR – Ministry of Water Resources

NPC – National Project Coordinator

RE – Resident Engineer

SRG – Sustainable Research and Development Center

UNDG – United Nations Development Group

WUA – Water Users Association

List of Sites and Persons Interviewed

Site: Swiera Pump Station-Al Zakitiah

Persons Interviewed

1.	Prof. ABDL KAREEM HALOUM	DIRECTOR of the SWEIRA'S WATER RESOURCES DEPARTMENT
2.	Prof. WALID KHAZAAL ABBAS	PUMP STATIONS DIRECTOR
3.	Prof. ALI ABDULLAH MOHAMMAD	TECHICAL MANAGER
4.	ABDL KAZEM SAHEN	PUMP OPERATOR
5.	MOHAMMAD HUSSEIN OBAID	PUMP OPERATOR

Site: Mandili

Persons Interviewed

1.	SALEM MAHMOUD SALEH	ENGINEER AND DIRECTOR OF THE SITE
2.	ABDLSAMAD REDA	ASSITANT HEAD OF THE ENGINEERS
3.	ABDL JALIL IBRAHIM KAZEM	TECHNICAL MANAGER/STATION OPERATOR
4.	FATIMA ALI KHALIL	HEAD OF OLD ENGEENERS- HEAD OF PUMP STATIONS IN DIYLA

Site: Hataman Pump Station

Persons Interviewed

1.	Prof. IBRAHIM WAHEED	DIRECTOR, THI QAR PUMPS STATIONS.
2.	HALIM MIZHER MAKTOUF	ASISTANT TECHICAL MANAGER
3.	ADNAN HILOU PRISSE	PUMP OPERATOR
4.	MAJED KHALAF JABER	PUMP OPERATOR
5.	ALI HUSEIN ENAD	PUMP OPERATOR

Site: South Al-Huseiniah Drainage Pumping Station

Persons Interviewed

1.	ABDUL KAZEM MUAKITH	Chief Engineer
2.	MUHSEN HARBY	Station operator

Site: Sejlah Drainage pump Station

Persons Interviewed

1.	HASSAN JASIM TAYEH	OLD Engineer
2.	YOUDEF MOHAMMAD ABDL HUSSEIN	OLD Head of ENGINEERS
3.	FADEL MUHSEN RASHEED	TECHNICAL SUPORTER
4.	HASHEM KAZIM KAREEM	PUMP OPERATOR

Site: Salman Bak Bazel Station- Stores

Persons Interviewed

1.	JABBAR SAHEB	Head of Stations Division
2.	ENG. SALEEM	Assistant of the Head of the stations Division
3.	ENG. HAMEED ALI	Maintenance Officer
4.	ENG. ALA' SAEED	Baghdad Stations Officer at the Ministry
5.	ENG. ALI MIKDAD	General Supervisor of Baghdad and Al-Kout Stations

Site: Al Mosel Dam
Persons Interviewed

1.	ABDL KHALIQ DHANOUN	Manager of Mosel Dam
2.	Eng. FATHI HASSAN	Manager of the Upper Dam Filling
3.	Eng. JASEM MOHAMMAD SALEH	Engineer of the Upper Dam Filling
4.	Eng. HOSHEIR	Engineer of Digging and Filling the Upper Dam.

Site: Ameriah Pump Station/Stores
Persons Interviewed

1.	Eng. Jabbar Saheb	Head of the Stations Division
2.	Eng. Saleem	Assistant Manager of the Stations Division
3.	Eng. Buthinah	General Supervisor of Alanbar Stations
4.	Eng. Khair Allah Thabet	Maintenance Officer- Stations
5.	Haider Abu Karar	Ministry's Store Keeper

Site: Ground Water Irrigation Directory
Persons Interviewed

1.	SARDAR OMAR QADER	DIRECTOR, of the IRRIGATION AND GROUND WATER
2.	RZGAR ABDL HAMEED HAMMADEN	ENGINEER/SUPERVISOR of the EPROJECT
3.	ANWAR JAHFAR HAMED	FAO COORDINATOR -ARBEEL

Site: Hila Hashemiah Drainage
Persons Interviewed

1.	HAIT JAFET HAIT	Civil Engineer
2.	JASEM MOHAMMAD ABOUD	Civil Engineer

Site: Sejlah Drainage Pump Station
Persons Interviewed

1.	HASSAN JASIM TAYEH	OLD Engineer
2.	YOUDEF MOHAMMAD ABDL HUSSEIN	OLD Head of ENGINEERS
3.	FADEL MUHSEN RASHEED	TECHNICAL SUPORTER
4.	HASHEM KAZIM KAREEM	PUMP OPERATOR

Site: Kirkuk Water Resources District
Persons Interviewed

1.	ABEDUL JAD BIKTASH	DIRECTOR OF THE STATION DIVISION
2.	ENG. MOHAMMAD HADI	WORKING TEAM LEADER
3.	ENG. FALAH HUSSEIN MOHAMMAD	MAINTENANCE ENGINEER
4.	ENG. SHIHAB HAKEEM	MAINTENANCE ENGINEER

Site: Babel Water Resources District
Persons Interviewed

1.	Prof. Saeed Abdullah Saeed	Babel Water Resources Assistant Manager
2.	Prof. Hameed Rashid Bahiah	Babel Water Resources Manager
3.	Eng. Ali Jaffar	Maintenance Engineer
4.	Laith Aziz	Babel Water resources Assistant Manager

5.	Eng. Mahmoud Sami	Babel Water resources Assistant Manager

Site: Mosel Dam

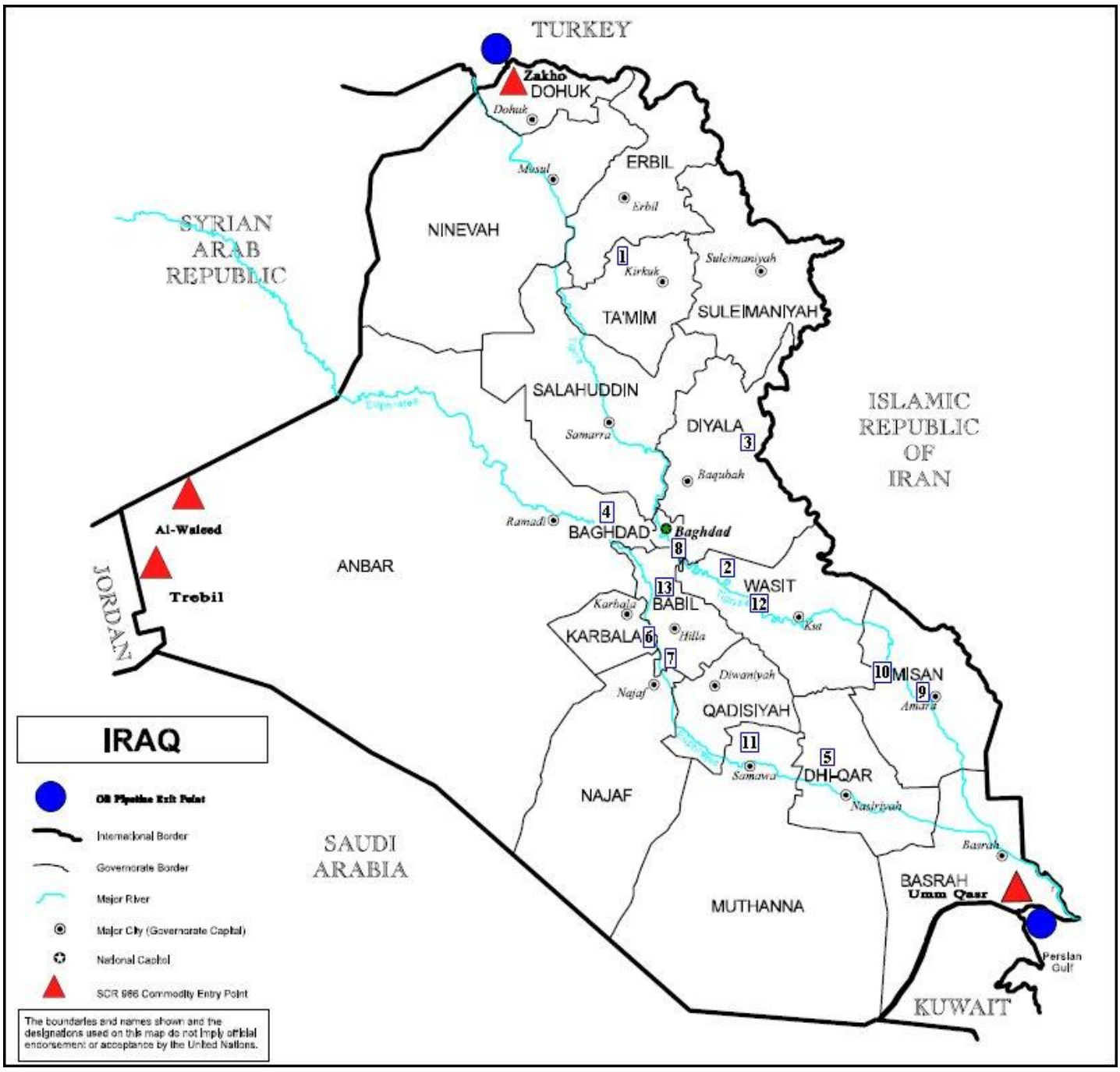
Persons Interviewed

1.	Abdul Khaliq Dhanoun	Manager of Mosel Dam
2.	Eng. Fatehi Hassan	Manager of the Upper Dam Filling
3.	Eng. Jasem Mohammad Saleh	Engineer of the Upper Dam Filling
4.	Eng. Hoshiar	Engineer of Digging and Filling the Upper Dam

FAO Staff:

1.	Dr. Fadel	Head Iraq FAO office in Jordan
2.	Mr. Paul Schlunke	Project Manager, Iraq FAO office in Jordan
3.	Mr. Radwan	FAO office in Bagdad

OSRO/IRQ/403/UDG PUMP STATION REHABILITATION PROJECT
LOCATIONS OF PROJECT PUMPING STATIONS



Project	Legend	Pump Station	Governorate	District	Sub-District	Distance from Baghdad to P.S Km
403	1	Kirkuk	Tameem	Dibis	-	315
403	2	North Suwira	Wasit	Suwira	Al-Mazra'a	50
403	3	Mandli /1	Diyala	Baquba	Al Sedoor	145
403	4	Al-Amiryah	Anbar	Falluja	Al-Amiriyah	110
403	5	Huttaman	Dhi-Qar	Naseriyah	Dawaya	430
403	6	Al Sijilah	Karbala'a	Hidiyah	Al-Khirat	150
403	7	Al-Hussainiyah	Babel	Kifil	-	150
403	8	Salman Pak	Baghdad	Al-Mada'in	Al'Lig	50

403	**9**	**Nahar Saad**	**Missan**	**Kumait**	**-**	**420**
403	**10**	**Abo Bushut**	**Missan**	**Kumait**	**-**	**410**
403	**11**	**Al-Rumatha (Al-Muhadad)**	**Al-Muthanna**	**Sumawa**	**Al-Warka'a**	**320**
403	**12**	**New Suwaira (Halata)**	**Wasit**	**Alaziziyah**	**-**	**85**
404	**13**	**Al - Musayeb (Drain 22)**	**Babel**	**Musayeb**	**Sadat Al- Hindiya**	**65**